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Knowledge of English morphology was studied in intellectually retarded (IQ 50 to 80), normal (IQ 90 to 110), and superior (IQ 120+) children at four chronological age (CA) levels from 4 to 12. The task involved using inflectional and derivational suffixes at two levels of generality: producing inflected and derived forms of English words, and applying rules of English morphology to provide inflected and derived forms of new (nonsense) words. Results indicated that some suffixes were used with perfect accuracy by younger children, whereas other suffixes were not used accurately even by older children; however, for most suffixes accuracy of use increased with age. Some suffixes were used by all three groups with similar accuracy at earlier CA's; most were used more accurately at the earlier CA's by the more intelligent children with the differences disappearing at later CA's; and some were used more accurately by the more intelligent children at both the earlier and later CA's. Study of the variations in generality revealed that, although some suffixes were used more accurately with English words than with new words, most suffixes were used with similar accuracy at both levels of generality. Accuracy in using suffixes differed among morphemes, with larger differences for younger, less intelligent children and smaller ones for older, more intelligent children. (Author/JD)

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# KNOWLEDGE OF ENGLISH MORPHOLOGY EXHIBITED BY INTELLECTUALLY RETARDED, NORMAL, AND SUPERIOR CHILDREN IN THE CA FOUR TO TWELVE YEAR RANGE

Kathryn A. Blake and Charlotte L. Williams

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## PREFACE

This report is made as part of the activities of the Research and Development Center in Educational Stimulation, University of Georgia, pursuant to a contract with the U. S. Department of Health, Education, and Welfare, Office of Education, under provisions of the Cooperative Research Program.

It is a pleasure to acknowledge the contributions of those who participated in the project. Appreciation is extended to those named below.

Jerry C. Allen merits special recognition. Mr. Allen took part in all of the data collection and data processing activities. In addition, he supervised the production of the final report of the project.

Children who were subjects in the project were located in five counties in Georgia: Chatham, Clarke, Franklin, Hall, and Oconee. A number of personnel in these five counties cooperated by providing the setting for the research and by assisting in scheduling and in similar project activities. These personnel include the following: Jewel Arrowood, James Ashe, Dorothy Ayers, Sara Banks, Saxon Bargeron, Immal Brooks, Annette Cantrell, Anne Conley, Anne Downs, Sarah Duncan, Joyce Fowler, Frances Gantt, Elizabeth Gentry, Anne Gilbert, Elliot Harvard, Faye Holland, Jeanne Johnson, Deborah Long, Clyde Maxwell, Emma Michaels, Hinckley Murphy, Vera Neidenbach, Joseph Nicholson, James Niedermayer, Ruth Nix, Hallie Norville, Mildred O'Barr, Winifred Payne, Betty Phillips, Miriam Purdy, Jack Ratley, Cecil Register, Jere Ridgway, Ruth Robertson,

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Secretarial activities were performed by Evelyn Monroe, Andrea Pampalon, Eileen Patrick, and Whitney Smith. Joan Bond and Kathryn Browne were clerical assistants.

While the above-named people made valuable contributions to the project, the project directors alone bear the responsibility for any errors and inadequacies in planning, executing, interpreting, and reporting the investigation.

Kathryn Blake

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# KNOWLEDGE OF ENGLISH MORPHOLOGY EXHIBITED BY INTELLECTUALLY RETARDED, NORMAL, AND SUPERIOR CHILDREN IN THE CA FOUR TO TWELVE YEAR RANGE

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## ABSTRACT

Subjects were retarded, normal, and superior children at four age levels: 4-0 to 5-11, 6-0 to 7-11, 8-0 to 9-11, and 10-0 to 11-11 years. The task involved using inflectional and derivational suffixes at two levels of generality: producing inflected and derived forms of English words, and applying rules of English morphology to produce inflected and derived forms of new (nonsense) words. The four research objectives pertained to age trends, relative performance of retarded, normal, and superior groups, variations in generality, and variations in morphemes.

1) Trends over CA levels were present for most morphemes at both levels of generality: exceptions were those instances in which a given morphological rule had been mastered by all subjects or when a given morphological rule had not been mastered by subjects.
2) Retarded, normal, and superior groups showed both similarities and differences in performance; specific relationships among the three groups varied with the morphological task in conjunction with the age level of the subjects.
3) In some cases, subjects were more accurate in inflecting and deriving English words than they were in using morphological rules in inflecting and deriving new words. However, in most cases, the subjects showed similar facility at the two levels of generality.

4) The extent of variations among morphemes was related to age and intelligence. Younger and less intelligent subjects showed more heterogeneity among morphemes; older and more intelligent subjects, less heterogeneity.

# CHAPTER 1. PROBLEM

## Purpose and Objectives

The purpose in this investigation was to examine intellectually retarded, normal, and superior subjects' use of selected inflectional and derivational suffixes at two levels of generality. Specifically, the two levels of generality were (1) producing inflected and derived forms of English words, and (2) applying rules of English morphology in producing inflected and derived forms of new words. The inflectional suffixes and the form classes of the stems or root words were the plural {-s} with a noun (car/cars), the singular {-'s} and plural {-s'} possessive with a noun (king/king's, kings/kings'), the past tense {-ed} with a verb (chase/chased), and the comparative {-er} with an adjective (big/bigger). The derivational suffixes and the form classes of the stems were the noun marker {-er} with a verb (drive/driver), noun marker {-ness} with an adjective (sleepy/sleepiness), the adjective marker {-less} with a noun (hair/hairless), and the adjective marker {-able} with a verb (like/likeable). The intellectually retarded, normal, and superior subjects had chronological ages within the range 4-0 years to 11-11 years.

The specific research objectives were to obtain data germane to four questions.

1. Presence of Age Trends. -- Within retarded, normal, and superior groups, respectively, is there an age trend in the use of each suffix at each level of generality?

2. Relative Performance of Retarded, Normal, and Superior Groups. -- Do retarded, normal, and superior groups differ in use of each suffix at each level of generality?

3. Variations in Generality. -- Within retarded, normal, and superior groups, respectively, do subjects' levels of accuracy in inflecting and deriving English words differ from their levels of accuracy in using morphological rules to inflect and derive new words?

4. Variations Among Morphemes. -- Within retarded, normal, and superior groups, respectively, do subjects' levels of accuracy differ among suffixes used at each level of generality?

## Related Research

The present section includes brief comments about research on English morphology and implications of such research. Related research and implications are given more detailed consideration subsequently in Chapter 4, "Discussion and Implications".

Previous investigators who have reported data relevant to aspects of the present study include Berko (1958), Cooper (1965), Lovell and Bradbury (1967), Miller and Erwin (1964), and Velten (1943). The present study was an extension of this previous research. Extensions included the sampling of subjects within a wider range of CA and IQ, the examination of a number of derivational suffixes as well as inflectional suffixes, and the testing of each suffix at two levels of generality -- English words and rules.

Data from studies like the present and previous ones have implications for psycholinguistics and pedagogy. Within the framework of psycholinguistics, the data are evidence about variables which influence morphological performance (Carroll, 1967; Cazden, 1967). Within the framework of pedagogy, the data are evidence which can be used in conjunction with other considerations in making differentiations in such educational practices as age-grade placement and sequencing of specific language arts skills, and so on (Strickland, 1962; Thomas, 1965).

# CHAPTER 2. PROCEDURE

## Subjects

Eight subjects were selected for each of 12 cells in an array formed by four CA levels and three IQ levels. The CA levels were CA 4-0 to 5-11, CA 6-0 to 7-11, CA 8-0 to 9-11, and CA 10-0 to 11-11. The IQ levels were retarded (IQ 50-80), normal (IQ 90-110), and superior (IQ 120+). There were 24 subjects per CA level and 32 subjects per IQ group. IQs were obtained on the 1960 Revision of the Stanford-Binet Test of Intelligence, Form LM. With one exception, subjects were selected from preschools and elementary schools. The exception was six retarded subjects at CA 4-5 who were not in preschools. All subjects appeared to be free from physical, sensory, or emotional disturbances which were sufficiently severe to interfere with responses to the research activities. All subjects were Caucasians; they were selected from small urban or middle-sized urban areas.

Table 1 contains descriptive statistics pertaining to CA, IQ, MA, and frequencies of boys and girls. Table 2 contains inferential statistics yielded by the analyses of the subject variables.

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Insert Tables 1 and 2 about here.

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The results of the analyses of the subject variables indicated the following.

1. The retarded, normal, and superior groups did not differ in CA. They differed in the expected directions in IQ and MA.

2. The groups at the four CA levels did not differ in IQ. They differed in the required directions in CA and MA.
3. For the IQ and CA variables, the G X L interaction factor was not significant. As would be expected when CA is held constant and IQ is varied, there was an interaction for the MA variable. At the higher CA levels, the differences between the IQ groups' MAs were larger; or, stated in another form, the retarded, normal, and superior groups had differential MA increments over CA levels.
4. The frequencies of boys and girls did not differ when subjects were categorized by IQ groups or by CA levels.

## Task

The task developed by Berko (Berko, 1958; Berko and Brown, 1960) was the model for the task used in the present study to sample children's use of selected inflectional and derivational suffixes. Briefly, verbal comments and pictures were used to establish a linguistic environment or verbal context for a given inflected or derived form. The subject had to produce or supply the appropriate inflection or derivation.

Five inflectional suffixes and four derivational suffixes were selected from the categories described by Francis (1958) in his discussion of English morphology. The combinations of bound and unbound morphemes selected for study were specified above in the introduction. These are recapitulated briefly here. For the inflectional items, the respective suffixes and form classes of the stems or root

words were the following: plural (/-z/ allomorph), noun; singular and plural possessive (/-z/ allomorph), noun; past tense (/-d/ allomorph), verb; and comparative (/-ər/ allomorph), adjective. For the derivational items, the respective suffixes and form classes of the root words were these: noun marker {-er} (/-ər/ allomorph), verb; noun marker {-ness}, adjective; adjective marker {-less}, noun; and adjective marker {-able}, verb.

The subjects' accuracy in using these items was tested at two levels of generality: with English words, and, at the more general level of rules with ostensibly new words (nonsense items in the present study). The nonsense words used to test ability to apply morphological rules were constructed by the investigators. The investigators attempted to make the nonsense words correspond to the English words in number of syllables, phonological configuration, and other aspects.

Sixteen sets of stimulus items were used to represent each combination of the suffixes and form classes and the levels of generality (English words/nonsense words): e.g., plural, English word; plural, nonsense word; past tense, English word; and so on. Six items were used to represent each set. Consequently, the task consisted of 96 items.

Each of the 16 sets of stimulus items was considered to be a subtest. The subtests were designed to yield scores for each suffix by form class combination at each level of generality. Data obtained

from an independent, pilot-test sample were used in estimating reliability of each subtest. Reliability coefficients were computed by the split-half method (odd-even) and corrected by the Spearman-Brown prophecy formula. Among subtests, these reliability coefficients ranged in size from .88 to .99.

As stated above, the stems or root words were represented by pictures and words. Verbal comments were used to establish the linguistic environments, that is, the contexts designed to elicit the bound morphemes. These verbal comments are reproduced in the Appendix. The verbal comments were read to the subject as he was shown the pictures. His responses were recorded simultaneously on audio tape and on a score sheet.

The total task was divided into three parts for administration. Each part consisted of 32 items (2 items from each of the 16 sets of stimuli). The three parts were administered to each subject individually in three separate sessions. Each part required, on the average, 15 minutes to administer.

Figure 1 contains a list of the sixteen sets of task items defined by the suffixes and form classes and the two levels of generality; in addition, Figure 1 has a list of the positions that each item within a set had in the task. Each item is preceded by an alphanumeric designation indicating the part of the task in which it appeared and its position in the sequence of items administered to the subjects.

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Insert Figure 1 about here.

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# CHAPTER 3. RESULTS

The scheme for presenting results is this. Descriptive data are presented first. These data include the following: for each morphological element, means of scores attained by subjects in each CA X IQ level subgroup and graphs illustrating relationships among these means. These descriptive data correspond to the inferential statistical data in subsequent sections devoted to the four research questions: i.e., to the presence of age trends; relative performance of retarded, normal, and superior groups; variations in generality; and variations in morphemes. Presentation of the inferential data follows this sequence: restatement of the research question, specification of the statistical procedures, statement of a generalization based on evidence related to the research question, and presentation of more specific relationships. One mechanical note is pertinent here: In the presentations of specific relationships, percentages are used in describing performance; however, untransformed scores were used in the inferential statistical analyses.

## Descriptive Data

Tables 3, 4, and 5 contain the means for the retarded, normal, and superior groups, respectively. Figure 2 contains the graphs.

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Insert Tables 3, 4, and 5
and Figure 2 about here.

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## Presence of Age Trends

The research question was this: Within retarded, normal, and superior groups, respectively, is there an age trend in the use of each suffix at each level of generality? In the analyses, data for each group were considered separately. The statistical procedures included single-factor analyses of variance and examination for linear, quadratic, and cubic trends (Edwards, 1963; Steele and Torrie, 1960). Descriptive data are in Tables 3, 4, and 5 and in Figure 2. Table 6 contains inferential statistics.

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Briefly, the results of the statistical analyses indicated these relationships. Within each group -- retarded, normal, and superior, respectively, the trends of the means over age were significant for most suffixes at each level of generality. Trends in the means were not significant in two kinds of situations: (1) when the suffix was used with nearly-perfect or perfect accuracy by CA 4-5 (e.g., using the plural {-s} with nouns); and (2) when the suffix was used with near-zero or zero accuracy at the four age levels (e.g., using the adjective marker {-able} with verbs). More specific relationships are described below.

## The Plural {-s} With Nouns

Forming the Plural of English Nouns. -- By CA 4-5, the retarded subjects showed about 90% accuracy in forming the plural of nouns; the normal and superior groups showed 100% accuracy. None of the groups showed significant increments at subsequent ages.

Applying the Rule for the Plural to New Words. -- The normal and superior subjects at CA 4-5 attained nearly-perfect scores for applying the rule for the noun plural; at subsequent ages, they showed no further change in scores. The retarded subjects had about 69% accuracy at CA 4-5. At subsequent ages, they showed increasing accuracy in applying the rule for forming the noun plural; they attained perfect scores at CA 10-11.

## The Singular Possessive {-'s} With Nouns

Forming the Singular Possessive of English Nouns. -- At CA 4-5, the retarded subjects attained about 63% accuracy in forming the singular possessive of English nouns. They remained at this level of accuracy at CA 6-7. Then, they showed increments to nearly-perfect scores at CA 10-11. At CA 4-5, the normal subjects attained about 75% accuracy while the superior subjects attained about 81% accuracy. Both groups showed increments to CA 6-7 to nearly-perfect scores.

Applying the Rule for the Singular Possessive to New Words. -- The youngest retarded subjects attained about 56% accuracy. At subsequent ages, they continued to show improvements until they reached nearly-perfect scores at CA 10-11. The normal and superior subjects, respectively, attained about 71% and 81% accuracy at CA 4-5. Both groups showed increments to nearly-perfect scores by CA 6-7.

## The Plural Possessive {-s'} With Nouns

Forming the Plural Possessive of English Nouns. -- At CA 4-5, the retarded, normal, and superior subjects attained about 61%, 79%, and 88%, respectively, in using the plural possessive form of English nouns. The retarded subjects showed increments to nearly-perfect scores at CA 10-11. The normal subjects attained perfect scores at CA 6-7 and maintained this level subsequently. There was no significant trend in the means of the superior subjects; these subjects showed high accuracy initially.

Applying the Rule for the Plural Possessive to New Words. -- Initially, the retarded subjects attained about 54% accuracy in applying the rule for the plural possessive. At subsequent ages, they showed increments to nearly-perfect scores at CA 10-11. At CA 4-5, the normal and superior subjects attained about 75% and 79% accuracy, respectively. Both groups showed increments to CA 6-7 where they attained perfect or nearly-perfect scores.

## The Past Tense {-ed} With Verbs

Forming the Past Tense of English Verbs. -- The retarded subjects at CA 4-5 attained about 36% accuracy in forming the past tense of English verbs. They showed increments to CA 8-9 where they leveled off at about 83% accuracy. The normal and superior subjects attained about 90% of the possible score at CA 4-5; at subsequent age levels, neither group's scores changed significantly.

Applying the Rule for the Past Tense to New Words. -- The retarded subjects applied the rule for forming the past tense to new words with about 21% accuracy at CA 4-5. Subsequently, they showed improvement in accuracy until CA 8-9 where they leveled off at about 69% accuracy. The normal subjects attained about 77% of the possible score at CA 4-5 and they continued at this level of accuracy at CA 6-7. Then, they showed increments to perfect scores at CA 10-11. The superior subjects at CA 4-5 reached about 83% accuracy in applying the rule. They showed increments to CA 8-9 where they attained perfect scores.

## The Comparative {-er} With Adjectives

Forming the Comparative of English Adjectives. -- At CA 4-5, the retarded subjects attained about 6% of the possible score for forming the comparative of English adjectives. At subsequent ages, they showed increments to about 81% accuracy at CA 10-11. The normal subjects attained about 25% accuracy at CA 4-5. Subsequently, they showed increments to 100% accuracy at CA 10-11. The superior subjects attained about 54% of the possible score at CA 4-5. They showed increments to 100% accuracy at CA 8-9 where they essentially leveled off.

Applying the Rule for the Comparative to New Words. -- At CA 4-5 and CA 6-7, the retarded subjects attained about 2% of the possible score for applying the rule for the comparative. Then, they showed increments to about 61% accuracy at CA 10-11. The normal and superior

groups, respectively, attained about 13% and about 38% accuracy at CA 4-5. Then, both groups showed increments to CA 8-9 where they leveled off with nearly-perfect scores.

## Noun Marker {-er} With Verbs

Nominalizing English Verbs. -- At CA 4-5, the retarded subjects attained about 2% accuracy in nominalizing English verbs. At subsequent age levels, they showed increments reaching a level of about 71% accuracy at CA 10-11. The youngest normal subjects attained about 17% of the possible score. They showed a small increment to CA 6-7 and then a large increment to CA 8-9 where they leveled off at perfect or nearly-perfect accuracy. The superior subjects had about 31% accuracy at CA 4-5; then, they showed a large increment to CA 6-7 where they leveled off with nearly-perfect scores.

Applying the Rule for Nominalizing Verbs to New Words. -- At CA 4-5, the retarded subjects made no correct responses to items involving applying the rule for nominalizing verbs. They showed increments at subsequent CA levels to about 52% accuracy at CA 10-11. The normal subjects at CA 4-5 attained about 6% accuracy. They showed a small increment to CA 6-7, a large increment to CA 8-9, and then a small increment to nearly-perfect accuracy at CA 10-11. The youngest superior subjects attained about 15% accuracy. They showed a large increment to CA 6-7 and then a smaller increment to CA 8-9 where they leveled off with perfect scores.

Noun Marker {-ness} With Adjectives

Nominalizing English Adjectives. -- At CA 4-5, the retarded subjects made no correct responses to items requiring the use of a noun marker with English adjectives. Generally, at the four age levels, the trend in the means was not significant. The youngest normal subjects made no correct responses. At subsequent ages, they showed increments and reached about 58% accuracy at CA 10-11. The superior subjects also had no correct responses at CA 4-5. Then, they had a small increment to CA 6-7, a large increment to CA 8-9, and a small increment to about 94% accuracy at CA 10-11.

Applying the Rule for Nominalizing Adjectives to New Words. -- The retarded subjects at the four age levels did not show any appreciable accuracy in applying the rule for nominalizing adjectives. The normal subjects through ages 6-7 did not make any correct responses. Then, they showed increments at the next two age levels to reach about 44% accuracy at CA 10-11. The superior subjects at CA 4-5 did not apply the rule correctly to any item. Then, they showed a small increment to CA 6-7 and large increments at the next two age levels to about 69% accuracy at CA 10-11.

Adjective Marker {-less} With Nouns

Adjectivizing English Nouns. -- The retarded subjects made no correct responses at CA 4-5. The trend of the means over the four age levels was not significant. The normal subjects did not use the adjective marker with nouns successfully at CA 4-5 or CA 6-7. Then,

they showed increments to CA 10-11 where they attained about 58% accuracy. The superior subjects made no correct responses at CA 4-5. Then, they showed increments to CA 10-11 and reached about 96% accuracy.

Applying the Rule for Adjectivizing Nouns to New Words. -- Retarded subjects made no correct responses at CA 4-5; similarly, the trend in the retarded subjects' means over the four age levels was not significant. The normal subjects made no correct responses at CA 4-5 or CA 6-7. Then, they showed a small increment to CA 8-9 and a larger increment to CA 10-11 where they attained about 46% of the possible score. The superior subjects at CA 4-5 did not make any correct responses to items involving applying the rule for forming adjectives from nouns. From this point, they showed increments over the later age levels culminating in about 75% accuracy at CA 10-11.

## Adjective Marker {-able} With Verbs

Adjectivizing English Verbs. -- The retarded subjects at CA 4-5 did not respond correctly to any items involving use of an adjective marker with a verb; the trend of the retarded subjects' means at the four age levels was not significant. The youngest normal subjects did not respond accurately at CA 4-5. At later age levels, they showed increments finally reaching about 19% accuracy at CA 10-11. The superior subjects attained about 4% accuracy at CA 4-5. Subsequently, they showed increments and reached about 40% accuracy at CA 10-11.

Applying the Rule for Adjectivizing Verbs to New Words. -- On items which involved applying the rule for adjectivizing verbs, the retarded subjects, the normal subjects, and the superior subjects at CA 4-5 did not show any appreciable accuracy. Also, the trends in the groups' means at the four age levels were not significant.

## Relative Performance of the Retarded, Normal, and Superior Groups

The research question was the following: Do retarded, normal, and superior groups differ in use of each suffix at each level of generality? Data were analyzed separately at each age level. The comparisons were made with t tests. Descriptive data are in Tables 3, 4, and 5 and in Figure 2. Inferential statistics are presented in Table 7.

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Insert Table 7 about here.
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In sum, the retarded, normal, and superior groups showed both similarities and differences in inflecting and deriving English words and in applying morphological rules for inflecting and deriving new words. In no case did the retarded group exceed the normal and superior groups or the normal group exceed the superior group. The similarities in performance or the less accurate performance of the less intelligent groups varied with the morphological task in conjunction with the age level of the subjects. More specific relationships are described below.

## The Plural {-s} With Nouns

Forming the Plural of English Nouns. -- The retarded, normal, and superior groups did not differ significantly at any age level in forming the plurals of English nouns. All three groups responded with perfect or nearly-perfect scores.

Applying the Rule for the Plural to New Words. -- At each age level, the normal and superior groups did not differ in the facility with which they applied the rule for the plural to new words. Both groups responded with perfect or nearly-perfect scores. At CA 4-5, the retarded group attained about 69% accuracy; their mean was lower than those of the normal and superior groups. At subsequent age levels, as retarded subjects improved in accuracy, the differences between the retarded and non-retarded groups were no longer significant.

## The Singular Possessive {-'s} With Nouns

Forming the Singular Possessive of English Nouns. -- At CA 4-5, the retarded, normal, and superior groups achieved about 63%, 75%, and 81% accuracy, respectively. The three groups did not differ at this level in forming the singular possessive of English nouns. Then while the normal and superior groups showed increments to nearly-perfect scores at CA 6-7, the retarded group showed no increment; the normal and superior groups exceeded the retarded group. At subsequent age levels where the retarded subjects attained nearly-perfect or perfect accuracy, the differences between the groups were no longer significant. The normal and superior groups did not differ at any age level.

Applying the Rule for the Singular Possessive to New Words. -- At CA 4-5, the retarded group attained about 56% accuracy in applying the rule for forming the singular possessive to new words. The normal and superior groups reached about 71% and 81% accuracy, respectively. The three groups did not differ significantly in accuracy. Then, as the normal and superior groups showed larger increments to CA 6-7, they exceeded the retarded subjects. At the later ages, as the retarded subjects showed increments, the differences between the groups did not differ at either age level in accuracy in applying the rule for forming the singular possessive of new words.

## The Plural Possessive {-s'} With Nouns

Forming the Plural Possessive of English Nouns. -- The retarded, normal, and superior groups responded with a fairly high degree of accuracy at all age levels. In no comparison did the groups differ significantly in the facility with which they formed the plural possessive of English nouns.

Applying the Rule for the Plural Possessive to New Words. -- Initially, the retarded, normal, and superior groups did not differ in the accuracy with which they applied the rule for forming the plural possessive; the three groups responded with 54%, 75%, and 79% accuracy, respectively. The normal and superior groups showed larger increments to CA 6-7 than the retarded group; and so, the non-retarded subjects exceeded the retarded subjects. At subsequent CA levels, while the

retarded subjects continued to show increments and the normal and superior groups leveled off at nearly-perfect or perfect scores, the differences between the groups were no longer significant. The normal and superior groups did not differ at any age level in the accuracy with which they applied the rule for the plural possessive.

## The Past Tense {-ed} With Verbs

Forming the Past Tense of English Verbs. -- The retarded, normal, and superior subjects at CA 4-5, respectively, attained about 36%, 90%, and 92% of the possible score for forming the past tense of English verbs; the non-retarded subjects exceeded the retarded subjects. At subsequent CA levels where the groups showed increments of different sizes, the following pattern of relationships emerged. The retarded and normal groups did not differ at CA 6-7 and CA 8-9 and then the normal group exceeded the retarded group at CA 10-11. The superior group exceeded the retarded group at CA 6-7; the groups came closer together at CA 8-9; and then the superior group again exceeded the retarded group at CA 10-11. The normal and superior groups did not differ significantly at any age level.

Applying the Rule for the Past Tense to New Words. -- Initially, the retarded, normal, and superior groups responded with about 21%, 77%, and 83% accuracy, respectively, in applying the rule for forming the past tense. The normal and superior groups had higher means than the retarded group. The superior group continued to exceed the retarded

group at each subsequent age level. The normal group continued to have significantly higher means at each age level except at CA 8-9. The normal and superior groups did not differ significantly at any age level in the accuracy with which they applied the rule for forming the past tense.

## The Comparative {-er} With Adjectives

Forming the Comparative of English Adjectives. -- At CA 4-5, the groups formed the comparative of English adjectives with the following degrees of accuracy: retarded group, about 6%; normal group, about 25%; and superior group, about 54%. The retarded and normal groups did not differ at CA 4-5. Then, as the groups showed unequal patterns of increments over the age levels, these relationships emerged: the normal group exceeded the retarded group at CA 6-7 and CA 8-9 while the groups did not differ significantly at CA 10-11. The superior group exceeded the retarded group at the first three age levels; then, as the superior group leveled off at a nearly-perfect or perfect score and the retarded group continued to improve, the difference at CA 10-11 was not significant. At all four CA levels, the normal and superior groups did not differ in the accuracy with which they formed the comparative of English adjectives.

Applying the Rule for the Comparative to New Words. -- On the items which involved applying the rule for forming the comparative adjective to new words, the accuracy for the retarded, normal, and superior groups

at CA 4-5 was about 2%, 13%, and 38%, respectively. At this age level, the retarded and normal groups did not differ. The normal group showed a larger increment to CA 6-7 and exceeded the retarded group in level of accuracy. At subsequent ages, the normal group continued to have significantly higher scores than the retarded group. At each age level, the superior group had higher scores than the retarded group. On the other hand, the normal and superior groups did not differ at any age level.

## Noun Marker {-er} With Verbs

Nominalizing English Verbs. -- At CA 4-5, the retarded, normal, and superior groups, respectively, attained about 2%, 17%, and 31% of the possible score for nominalizing English verbs. The superior group exceeded the retarded group but the retarded and normal groups and the normal and superior groups did not differ significantly. Then, as the three groups showed different patterns of increments at the next three age levels, the following relationships were apparent. At CA 6-7, the retarded and normal groups did not differ significantly while the superior group exceeded both groups. At CA 8-9 and CA 10-11, the normal and superior groups exceeded the retarded group and did not differ from each other.

Applying the Rule for Nominalizing Verbs to New Words. -- The retarded group did not respond correctly, at CA 4-5, to any items requiring the application of the rule for nominalizing new words. The normal and superior groups , respectively, responded correctly to about

6% and 15% of the items. The differences among the groups were not significant. At CA 6-7, the retarded and normal groups continued to respond with similar adequacy. Then, the normal group showed larger increments and exceeded the retarded group at the next two age levels. The superior group exceeded the retarded group at each age level after CA 4-5. The differential patterns of increments at the later age levels produced the following pattern of relationships between the normal and superior groups. After their initial equivalence, the superior group exceeded the normal group at CA 6-7 and CA 8-9. Then, at CA 10-11, as the superior group continued at the level of perfect scores and the normal group approached perfect scores, the two groups did not differ significantly.

## Noun Marker {-ness} With Adjectives

Nominalizing English Adjectives. -- None of the subjects at CA 4-5 responded accurately to items involving nominalizing English adjectives. At subsequent ages, the retarded, normal, and superior subjects showed differential patterns of increments and the following pattern of relationships emerged. At CA 6-7, the three groups still did not differ significantly. At CA 8-9, the normal and retarded groups continued to have equivalent scores while the superior group exceeded both groups. At CA 10-11, the normal group exceeded the retarded group and the superior group exceeded both the normal and retarded groups.

Applying the Rule for Nominalizing Adjectives to New Words. -- At the outset, none of the youngest subjects responded accurately to the

items which required application of the rule for nominalizing new words. Over the four age levels, the three groups showed an unequal pattern of increments. These relationships emerged among the groups. The normal and retarded groups did not differ significantly at CA 8-9; then, the normal subjects exceeded the retarded subjects at CA 10-11. The superior group did not differ from the retarded group at the first two age levels. Then, at the latter two age levels, the superior group exceeded the retarded. The normal and superior groups did not differ at CA 4-5 and CA 6-7. The superior subjects showed larger increments, and, at CA 8-9, the difference was significant. At CA 10-11, the normal and superior groups did not differ.

## Adjective Marker {-less} With Nouns

Adjectivizing English Nouns. -- The retarded, normal, and superior groups did not respond accurately at CA 4-5 to items requiring adjectivizing English nouns. As the groups showed differential patterns of increments at subsequent ages, a pattern of relationships emerged which is the same as that apparent above for nominalizing adjectives. That is, the three groups did not differ at CA 6-7. At CA 8-9, the superipr group exceeded both the retarded and normal groups while the retarded and normal groups did not differ. At CA 10-11, the superior group continued to exceed the retarded and normal groups while the normal group exceeded the retarded group.

Applying the Rule for Adjectivizing Nouns to New Words. -- As stated above, the patterns of relationships among the groups were

identical for nominalizing English adjectives and adjectivizing English nouns. Similarly, the pattern of relationships among groups for applying the two morphological rules were the same; that is, for the task involving application of the rule for adjectivizing nouns, these relationships were evident. None of the subjects at CA 4-5 responded accurately. Over the four age levels, the groups showed differential increments. At CA 6-7, the groups' means still did not differ significantly. Then, at CA 8-9, the superior group exceeded the normal and retarded groups while the normal and retarded groups did not differ. At CA 10-11, the superior and normal groups did not differ significantly while both groups exceeded the retarded group.

### Adjective Marker {-able} With Verbs

Adjectivizing English Verbs. -- At the outset, the retarded and normal subjects did not respond accurately to any items while the superior group responded with about 4% accuracy. At each of the four age levels, the retarded and normal groups did not differ, nor did the normal and superior groups. The retarded and superior groups did not differ at the first three age levels. Then, at CA 10-11, the superior group exceeded the retarded group.

Applying the Rule for Adjectivizing Verbs to New Words. -- At CA 4-5, the retarded, normal, and superior groups had zero scores or nearly-zero scores to items which required applying the rule for adjectivizing verbs. Also, they did not show significant increments over age levels. In no comparison did the groups' means differ significantly.

## Level of Generality

The research question pertaining to level of generality was the following: Within the retarded, normal, and superior groups, respectively, do subjects' levels of accuracy in inflecting and deriving English words differ from their levels of accuracy in using morphological rules to inflect and derive new words? The data were analyzed in the Treatment by Subjects design described by Lindquist (1953). Tables 3, 4, and 5 and Figure 2 contain descriptive information. The inferential statistics are in Table 8.

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Insert Table 8 about here.

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The results indicated the following. When subjects were accurate in inflecting and deriving English words, they also were accurate in applying morphological rules for inflecting and deriving new words. Conversely, when they were not accurate in dealing with English words, they were not accurate in applying morphological rules to new words. This generalization had several exceptions in which accuracy in inflecting and deriving English words exceeded accuracy in applying morphological rules to inflect and derive new words; however, in no comparison did accuracy in applying rules to inflect and derive new words exceed accuracy in inflecting and deriving English words. More specific relationships are listed below.

The Plural {-s} With Nouns. -- All three groups were accurate in forming the plural of English nouns and in applying the rule for forming plurals. At CA 4-5, the retarded group formed the plural of English nouns more accurately than they applied the rule for the plural. At subsequent ages, the retarded group did not differ in accuracy at the two levels of generality. At each of the four age levels, the normal and superior groups responded with similar accuracy at the two levels of generality.

The Singular Possessive {-'s} With Nouns. -- The three groups responded accurately to items requiring production of the possessive form of nouns. The groups did not differ in accuracy at the two levels of generality.

The Plural Possessive {-s'} With Nouns. -- Again, the subjects were accurate in producing the plural possessive form of nouns. The subjects responded with similar accuracy at the two levels of generality.

The Past Tense {-ed} With Verbs. -- In all three groups, subjects accurately formed the past tense of English verbs and applied the rule for forming the past tense. Within the retarded group, subjects' accuracy did not differ significantly at the two levels of generality except at CA 10-11. At CA 10-11, the mean for English words was significantly higher than the mean for new words. Within the normal group, the subjects' accuracy at the two levels of generality did not differ at the four age levels. At CA 4-5, the superior subjects' mean for inflecting English words was higher than their mean for applying the rule for the past tense. At later ages, the superior subjects' means at the two levels of generality did not differ significantly.

The Comparative {-er} With Adjectives. -- At CA 4-5 and CA 6-7, the retarded subjects did not respond very accurately to items involving the comparative at either level of generality; differences between their means at the two levels of generality were not significant. At later ages where they formed the comparative more accurately, the retarded subjects' means at the two levels of generality still were not significantly different. At CA 4-5, the normal subjects showed a low level of accuracy in forming the comparative; the subjects' means at the two levels of generality did not differ significantly. Subsequently, as their accuracy increased, the subjects' means at the two levels of generality still did not differ significantly. The superior subjects responded accurately to items which involved forming the comparative of adjectives. They used the comparative form with equal facility at the two levels of generality.

Noun Marker {-er} With Verbs. -- At CA 4-5 and CA 6-7, neither the retarded nor the normal subjects were very accurate in nominalizing verbs at either level of generality. At CA 8-9, they showed more accuracy; within both groups, subjects' means for English words were significantly higher than their means for applying the rule to new words. At CA 10-11, subjects' means at the two levels of generality did not differ significantly. Superior subjects did not respond very accurately at CA 4-5 to items involving nominalizing verbs at the two levels of generality. At CA 6-7, where they showed greatly improved accuracy, the superior subjects' means for English words were higher than their means for applying the rule. At CA 8-9 and CA 10-11, the superior subjects responded with similar accuracy at the two levels of generality.

Noun Marker {-ness} With Adjectives. -- Retarded subjects did not nominalize English adjectives very accurately at any CA level. As can be expected, when subjects do not use the English form accurately, they did not show any higher accuracy in using the rule for nominalizing new words. At CA 4-5 and CA 6-7, the normal subjects did not use the noun marker very accurately at either level of generality. Then, at CA 8-0 and CA 10-11, the normal subjects used the noun marker more accurately. At both age levels, normal subjects showed higher accuracy in using the noun marker with English words than they did in applying the rule to new words. The superior subjects showed the same pattern as the normal subjects.

Adjective Marker {-less} With Nouns. -- Within the retarded group, the pattern of relationships for adjectivizing nouns was similar to the pattern of relationships for nominalizing adjectives. Retarded subjects did not use the adjective marker very accurately at either level of generality. The normal subjects did not use the noun marker accurately at CA 4-5 and CA 6-7. As they improved in performance at the later age levels, the normal subjects' means at the two levels of generality did not differ significantly. The superior subjects did not use the adjective marker accurately at CA 4-5. As their performance improved at CA 6-7, they still responded similarly at the two levels of generality. Then, with continued improvement at the later age levels, superior subjects' accuracy in using the adjective marker with English words was higher than their accuracy in applying the rule.

Adjective Marker {-able} With Verbs. -- The retarded subjects did not use the adjective marker with a verb very accurately at any age level; it follows, they did not apply the rule for adjectivizing verbs accurately. The normal subjects showed gradual improvement over the age levels in adjectivizing English verbs; however, at no time were they more accurate with English words than with applying the rule. The superior subjects showed improvement at the four age levels in adjectivizing English verbs. Only at CA 10-11 did their means for adjectivizing English verbs exceed their means for applying the rule for adjectivizing English verbs.

## Variations Among Morphemes

The research question was this: Within the retarded, normal, and superior groups, respectively, do subjects' levels of accuracy differ among suffixes used at each level of generality? Within each group, data were analyzed separately at each age level. Lindquist's (1953) Treatments by Subjects design was used to examine main effects; his critical difference technique was used for mean separation. Tables 3, 4, and 5 and Figure 2 contain descriptive data. Inferential statistics are in Table 9.

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Insert Table 9 about here.
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Results of the analyses are portrayed in Figure 3. In this portrayal, the following conventions were used. Suffixes were ordered

according to sizes of means. Sets of suffixes were enclosed in brackets [ ]. Means within bracketed sets did not differ significantly. Except for the overlapping of adjacent items, means of suffixes in a bracketed set of suffixes were significantly higher than those of suffixes in succeeding bracketed sets. The same suffixes were listed in two sets of suffixes to indicate overlapping of sets. The percentages used to portray range of accuracy are the % accuracy for the first element in a set of suffixes and the % accuracy for the last element in a set.

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Insert Figure 3 about here.
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In brief, the relative accuracy with which the subjects used the several suffixes at each level of generality varied with the CA level of the subjects. At the younger ages, the subjects used the several suffixes with varying degrees of accuracy; at the later ages, the subjects used increasing numbers of suffixes at similarly high levels of accuracy. The retarded, normal, and superior groups varied in the extent to which, as they got older, they increased in the number of suffixes they used at similarly high levels of accuracy. The groups varied in this order: superior, normal, and retarded. For example, as they got older, the superior subjects used the several suffixes at similarly high levels of accuracy. With increasing age, the retarded subjects still did not use the several suffixes with similarly high levels of accuracy. More specific details are illustrated in Figure 3.

# CHAPTER 4. DISCUSSION AND IMPLICATIONS

The first research question pertained to age trends: Within the retarded, normal, and superior groups, respectively, is there an age trend in the use of each suffix at each level of generality? The data indicated that within each group the trends of the means for most suffixes were significant. The trends were not significant for suffixes which the subjects produced at high levels of accuracy by CA 4-5 (e.g., {-s}, English noun) or for suffixes which subjects did not produce accurately at CA 10-11 (e.g., rule for {-able}, verb).

Previous investigators who studied age trends in children's use of suffixes include Berko (1958), Cooper (1965), Lovell and Bradbury (1967), Miller and Erwin (1964), and Velten (1943). Where the ages of the subjects sampled and the suffixes selected for study are comparable, the results obtained by the present investigators generally are consistent with results reported by previous investigators. Details are presented below.

Two studies involved longitudinal sampling of language of very young children. Miller and Erwin (1964) observed that children before CA 3 could, with some accuracy, apply the rule for the plural to inflect new (nonsense) words. In the present study, the retarded, normal, and superior groups at CA 4-5, respectively, applied the rule for the plural to new words with 69%, 100%, and 96% accuracy. Velten (1943) noted that when his daughter had reached CA 2-6 she correctly used with English words the plural, possessive, and past tense suffixes,

among others; her use of suffixes was not necessarily consistent. In the present study, the retarded, normal, and superior groups at CA 4-5 attained over 60% accuracy in using these suffixes in all cases except one. The retarded group used the past tense with only 36% accuracy at CA 4-5.

As Lovell and Bradbury (1967) commented, Berko (1958) did pioneer work in the use of the cross-sectional approach in studying children's knowledge of English morphology. Berko's results relevant to age trend and those obtained in the present study are hard to compare for at least four reasons. One reason pertained to age grouping. Berko's younger subjects were within the CA range 4 years 0 months to 5 years 5 months; her older subjects were in the CA range 5 years 6 months to 7 years 0 months. These age groupings overlapped with the CA 4-5 and CA 6-7 levels used in the present study. The second reason was the nature of the response measure. Berko compared the number of subjects making a right or wrong response on each item involving a given suffix. In the present study, subjects were compared on total scores on subtests which included six items involving a given suffix. The third reason pertained to the number of age levels used in the examination of age trends. Berko used two age levels; the present investigators used four age levels. The fourth reason pertained to consideration of IQ levels. In the present study, subjects were stratified on the basis of IQ. Berko commented that no IQs were available for her subjects. In view of these four differences in procedures, only tentative statements are possible and these tentative

statements pertain only to elements which were common to the two studies: inflecting new words on the basis of the rule for the plural (/-z/ allomorph), the singular and plural possessive (/-z/ allomorph), and the past tense (/-d/ allomorph). In the majority of the comparisons she made, Berko observed age differences for each of these suffixes except the past tense. In the present study, two adjacent age groups were not compared; however, inspection of the means suggested results similar to Berko's in all cases except the following. At CA 4-5, the normal and superior groups, respectively, attained nearly-perfect or perfect accuracy for applying the rule for the plural; they showed no further increments to CA 6-7. At CA 4-5, the retarded group attained only 36% accuracy in applying the rule for the past tense; they showed no increments in accuracy to CA 6-7.

Two further observations may be made about relationships between results obtained by Berko and by the present investigators. Berko had one item testing the application of the rule for forming the comparative and superlative forms of the adjective. She commented that she made no comparisons of age differences because only one out of eighty children between CA 4 and CA 7 responded correctly to the item. In the present study, the percentage of accuracy of subjects' responses to the six items sampling the comparative form of the adjective were the following: at CA 4-5, percentages of the total score obtained by the retarded, normal, and superior groups, respectively, were 2%, 13%, and 38%; at CA 6-7, the percentage accuracy scores for the retarded, normal, and superior groups, respectively, were 2%, 52%, and 86%.

Berko also did not examine age trends in subjects' responses to the item she employed to sample use of the rule for the noun marker with a verb stem. She reported that 11% of her 80 subjects in the CA 4 years 7 months range responded accurately to the item. In the present study, the subjects' accuracy in using the rule for the agentive suffix to derive new words was the following: at CA 4-5, the retarded, normal, and superior groups attained about 0, 6%, and 15% accuracy, respectively; at CA 6-7, the retarded, normal, and superior groups attained about 4%, 13%, and 81%, respectively.

Cooper (1965) examined morphological behavior of hearing and deaf subjects. He presented descriptive data about scores of subjects grouped in two-year intervals; the hearing subjects had a CA range of 7.0 to 13.9 while the deaf subjects had a CA range of 7.0 to 19.9. His response measures for the examination of age trends were total scores encompassing inflectional and derivational suffixes used with nonsense words in situations testing both receptive and productive control, respectively. The scores relevant to productive control were most nearly comparable to those used in the present study. Generally, both the hearing and deaf subjects showed increasing total scores over age. Cooper did not use inferential statistics to examine these age trends.

The second research question was pertinent to the relative performance of retarded, normal, and superior groups: Do retarded, normal, and superior groups differ in use of each suffix at each level of generality? Generally, the three groups showed both similarities and differences in inflecting and deriving English words and in applying morphological

rules for inflecting and deriving new words. In no case did the retarded group exceed the normal and superior groups or the normal group exceed the superior group. The similarities in performance or the less accurate performance of the less intelligent groups varied with the morphological element and the age level of the subjects.

The present investigators located only one previous study of morphological characteristics of retarded and non-retarded subjects; this previous study was reported by Lovell and Bradbury (1967). Lovell and Bradbury replicated Berko's procedures with retarded subjects who ranged in age from CA 8 to CA 15. The mean IQ of the total group was 70.1. The investigators compared responses of their 14 and 15 year-old subjects with data reported by Berko for her subjects in the CA 4-7 range. They used chi-square procedures to compare total numbers of responses by the two groups of subjects. The results obtained in the Lovell and Bradbury study and those obtained in the present study are not directly comparable for this reason, among others: in the present study, retarded, normal, and superior subjects were equated on CA. In the Lovell and Bradbury study, the retarded and non-retarded subjects were not equated on CA.

The third research question was relevant to variations in generality: Within the retarded, normal, and superior groups , respectively, do subjects' levels of accuracy in inflecting and deriving English words differ from their levels of accuracy in using morphological rules to inflect and derive new words? The results indicated the following.

When subjects were accurate in inflecting and deriving English words, they also were accurate in applying morphological rules for inflecting and deriving new words. Conversely, when they were not accurate in dealing with English words, they were not accurate in applying morphological rules to new words. There were several exceptions in which accuracy in inflecting and deriving English words exceeded accuracy in applying morphological rules to inflect or derive new words. In no comparison did accuracy in applying rules to inflect and derive new words exceed accuracy in inflecting and deriving English words.

The role of level of generality *per se* has not been studied extensively. In two publications, Miller and Erwin presented some pertinent evidence which they obtained in their study of the acquisition of the plural by young children. Erwin and Miller (1963) reported: "Learning of the plural for meaningful words almost always preceded that of the plural for nonsense words that had similar phonological shape, but the interval between the two was surprisingly short [p. 123]." Examination of their data (Miller and Erwin, 1964) indicated that this relationship existed primarily for nouns inflected with the /-z/ allomorph. The time discrepancy was longer for nouns inflected with the /-s/ and /-əz/ allomorphs and the irregular forms. The English nouns and their phonologically similar nonsense words used in the present study involved only the /-z/ allomorph. The retarded subjects at CA 4-5 formed the plural of English nouns with 90% accuracy. They applied the rule to nonsense words less accurately (69%). At later ages, as

their accuracy increased, the retarded subjects' responses did not differ at the two levels of generality. At CA 4-5 and later ages, the normal and superior groups responded with nearly-perfect or perfect accuracy at both levels of generality. Their accuracy in forming the plural did not differ between levels of generality. And so, the results of the present study are not inconsistent with the results of previous studies.

The fourth research question was germane to variations among morphemes: Within the retarded, normal, and superior groups, respectively, do subjects' levels of accuracy differ among suffixes used at each level of generality? The obtained data indicated these relationships. The relative accuracy with which the subjects used the several suffixes at each level of generality varied with the CA level of the subjects. At the younger ages, the subjects used the several suffixes with varying degrees of accuracy; at the later ages, the subjects used increasing numbers of suffixes at similarly high levels of accuracy. The retarded, normal, and superior groups varied in the extent to which, as they got older, they increased in the number of suffixes they used similarly at high levels of accuracy. The groups varied in this order: superior, normal, retarded. For example, as they got older, the superior subjects used the several suffixes at similarly high levels of accuracy. With increasing age, the retarded subjects still did not use the seve suffixes with similarly high levels of accuracy.

Berko (1958), Cooper (1965), and Lovell and Bradbury (1967) showed some concern with this problem. All commented that subjects produced some inflected or derived forms more accurately than others. These investigators presented descriptive statistics illustrating these relationships. They did not present inferential statistics. Generally, the results of the present study are consistent with the previous work in the sense that differences were present among suffixes. More specific comparisons among studies cannot be made in the absence of pertinent inferential statistical analyses of data obtained in the previous studies.

In brief, results obtained in the present study relevant to the four research questions are not inconsistent with results obtained in comparable parts of previous studies. The consistency supports the generality of the results. Nevertheless, evaluation of the results of the present study requires examination of several factors which could have affected the internal validity of the study. These factors pertain to younger subjects' enrollment and experiences in preschools, subjects' understanding of the requirements of the research situation, and subjects' motivational characteristics. That is, the possible effects of these factors need to be specified in order to make relatively unequivocal interpretations of results pertinent to the four research questions of the present study.

Consider first the possible effect of preschool enrollment on results germane to the relative performance of retarded, normal, and

superior subjects at CA 4-5. The eight normal and eight superior subjects at CA 4-5 levels were selected from preschools. Only two of the eight retarded subjects could be located in an extensive search of preschool classes; the six remaining retarded subjects were not in preschools. The problem is that the normal and superior subjects may have had experiences in the preschools conducive to more accurate morphological performance while the retarded subjects may have missed these experiences. Similarly, subjects in different preschools could have had experiences which differed in the extent to which they were related to morphological behavior. Thus, there could be a bias in the results pertinent to the relative performance of retarded, normal, and superior groups at CA 4-5. On the other hand, there are several reasons for believing that differential experiences related to preschool enrollment did not bias the results.

One of Berko's (1958) ideas is germane. She presented this idea in her discussion of why sex differences were not present in the morphological behavior of her subjects. She proposed that non-specific environmental differences do not exert a major role in morphological behavior. Berko (1958) commented as follows.

> What is suggested here is that every child is in contact with a sufficiently varied sample of spoken English in order for him to be exposed at an early age to the basic morphological processes. These processes occur in simple sentences as well as in complex ones. Practice with a limited vocabulary may be as effective as

practice with an extensive vocabulary, and the factors that influence other aspects of language development may have no effect on morphological acquisition [pp. 171-172].

Berko's suggestion appears reasonable. In addition, the pattern of the results obtained in the present study indicate that the effects of preschool enrollment and activities did not bias the results systematically. That is, groups were compared on 18 morphological elements (nine suffixes at two levels of generality). The retarded subjects at CA 4-5 responded less accurately than more intelligent subjects on five inflected forms: plural, rule; past tense, English word and rule; comparative adjective, English word and rule. The groups at CA 4-5 did not differ on the remaining 13 elements. The normal and superior subjects at CA 4-5 did not differ on any aspect of morphological behavior. It would seem that if preschool experiences were exerting an effect, more differences would have occurred.

A further point is pertinent. The preschool subjects were selected from four different preschools. An attempt was made to locate preschools in which special systematic attention was not given to language arts instruction. In addition, the 18 subjects in preschools were distributed over the four different preschools. That is, the subgroups of two retarded, eight normal, and eight superior subjects at CA 4-5 levels were not selected from the same preschool. Consequently, it is unlikely that differential enrollment and experiences in preschools unduly biased the results pertaining to the relative accuracy of retarded, normal, and superior subjects.

Another question which might be posed about the present study is this: Did the subjects, especially the younger subjects and particularly the younger retarded subjects, understand the requirements of the task used to sample morphological behavior? For several reasons, it seems that the subjects did understand what was expected of them and that they made bona fide responses to the task. Each subject was examined individually. Before the task was initiated, examples were used to explain and illustrate the task for the subject. Explanation continued until the subject could complete at least one example satisfactorily. Further evidence is in the observation that all subjects, including the younger subjects, responded with a high degree of accuracy to items involving some morphemes, e.g., the plural of the noun. Items sampling these morphemes appeared in all parts of the total task. If the subjects did not understand the task requirements, it would seem that their performance would be uniformly inaccurate. And so, it seems unlikely that inadequate understanding of task requirements operated to bias results.

Another source of possible bias pertained to possible differential motivational characteristics. That is, in comparison to more intelligent pupils, retarded pupils often experience failure in academic tasks. In turn, they may show negative reactions in new situations like the one involved in the present study and these negative reactions might affect performance deleteriously. There are two sources of evidence that differential motivational characteristics did not bias the results of the present study.

The first source of evidence is previous research on motivational characteristics of retarded and non-retarded subjects: specifically, how expectations of, and reactions to, failure and frustration affect subjects' performance. Cromwell (1963) and Heber (1964) have reviewed much of this research. Most investigators have reported that retarded and non-retarded subjects did not respond differentially to failure and other types of frustration in research situations involving verbal cognitive tasks.

The second source of evidence is in the pattern of obtained results. In some cases, the retarded subjects responded less accurately than non-retarded subjects; in other cases, the groups of subjects did not differ in accuracy. It would seem that if motivational factors were biasing results in the direction of less accurate responses by the retarded subjects, the negative effect would have been more consistent over morphemes and age. For these and similar reasons, it seems justifiable to reject the notion that results were biased by differential motivational characteristics of the subjects.

In summary, results obtained in the present study relevant to the four research objectives were not inconsistent with results obtained in comparable parts of previous studies. Further, the present investigators did not judge the results to be unduly biased by such factors as differential preschool enrollment or experiences, differential ability to understand directions, or differential motivation. These observations furnished support for the internal and external validity of the study (Campbell and Stanley, 1963). Nevertheless, generalizations must

be limited to situations similar to those sampled in the present study: specifically, the subjects, the task, and the research situation. In addition, it must be stressed that the behavior sampled involved what Cooper (1965) termed productive control, and that the content consisted of nine suffix-form class combinations. Other suffix-form class combinations and other types of control of morphological behavior need to be examined. In the meantime, the results of the study have implications for psycholinguistics and pedagogy.

An example of implications in the area of psycholinguistics is this. Morphological performance was related to the subject variables studied, i.e., age and intelligence level. The nature of these relationships varied among the specific morphemes and, to some extent, between the levels of generality assessed. Further study is needed to specify these relationships more precisely as well as to identify other variables which may be operating. That is, it is only a first step to specify that age and intelligence level are related to performance; a next step is to identify what factors inherent in age and intelligence are operating and the extent to which treatment variables can be used to modify the effects of subject variables (Ellis, 1963). A further step, of course, is to examine the influence of other subject variables.

Several pedagogical implications are apparent. As an example, consider age-grade placement of instruction. At least two decisions, among others, must be made before suggestions can be made about age-grade placement. The first decision is whether to accept the notion

proposed by Strickland (1962), Thomas (1965), and others that an element should be in the pupil's language performance repertory before he is instructed in such skills as decoding (e.g., reading) or encoding (e.g., spelling) the element. Accepting this notion, the next decision pertains to the criterion for considering the element to be in the pupil's language performance repertory; that is, the level of accuracy at which the pupil needs to show his control of the element before he is judged to have mastery. For purposes of discussion, consider 50% accuracy as the criterion for considering the element to be in the pupil's language performance repertory. Using this criterion, the following implications are among those which are suggested by the results of the present study.

1. Other factors being equal, retarded, normal, and superior subjects are ready for instruction in language arts skills involving the plural suffix with nouns and the singular and plural possessive suffixes with nouns before CA 6.
2. Other factors being equal, for some morphemes (e.g., the plural form of the noun, /-z/ allomorph), no differentiation in age-grade placement of language arts skills needs to be made for retarded, normal, and superior pupils. For other morphemes (e.g., noun marker with a verb root), differentiation in age-grade placement of language arts skills is appropriate: superior pupils are ready for instruction at the CA 6-7 level, normal pupils are ready at the CA 8-9 level, while instruction for the retarded pupils might need to be delayed to the CA 10-11 level. Further, if there are

reasons for scheduling language arts instruction involving such elements earlier, then time should be devoted to teaching activities specifically designed to increase accuracy of performance in productive control of the elements. This instruction should be scheduled prior to instruction in specific language arts skills for encoding and decoding.

3. Other factors being equal, for some morphemes (e.g., adjective marker with a verb root), instruction in language arts skills for all subjects needs to be delayed until after CA 10-11. Here again, if specific language arts instruction needs to be scheduled earlier, then time should be devoted to specific readiness activities.

The three suggestions listed above are examples of implications of the data obtained herein for age-grade placement of instruction in language arts skills involving the aspects of morphology studied. Other such implications need to be and can be specified. Similarly, the data have implications for organizing or sequencing instruction within and among age levels; these implications also need to be and can be specified. However, all of these implications need to be posed within the framework of a given language arts program. The obtained results alone cannot be used to pose implications. Instead, they need to be considered in conjunction with other relevant factors. Note that even to give the

above examples the investigators had to make two decisions: about the need for prerequisite language characteristics and about the criterion for considering those prerequisite language characteristics to be present. Similarly, the investigators had to qualify the suggestions with the phrase "other factors being equal." Educators responsible for educational planning may choose to make other decisions about prerequisites and criteria. Similarly, other factors may not be equal. If so, the nature of the implications might vary. To repeat, the point is that educational implications of the data obtained in the present study need to be posed for specific language arts programs in terms of the assumptions, values, and exigencies accepted for those programs.

# REFERENCES

Berko, J. The child's learning of English morphology. Word, 1958, 14, 150-177.

Berko, J., & Brown, R. Psycholinquistic research methods. In P. H. Mussen (Ed.), Handbook of research methods in child development. New York: Wiley, 1960. Pp. 517-557.

Campbell, D. T., & Stanley, J. C. Experimental and quasi-experimental designs for research on teaching. In N. L. Gage (Ed.), Handbook of research on teaching. Chicago: Rand McNally, 1963. Pp. 171-246.

Carroll, J. B. Psycholinquistics in the study of mental retardation. In R. L. Schiefelbusch, R. H. Copeland, and J. O. Smith (Eds.), Language and mental retardation: empirical and conceptual considerations. Holt, Rhinehart, & Winston: New York, 1967. Pp. 39-53.

Cazden, C. B. On individual differences in language competence and performance. Journal of Special Education, 1967, 1, 135-150.

Cooper, R. L. The development of morphological habits in deaf children. In J. Rosenstein & W. H. MacGinitie (Eds.), Research studies on the psycholinquistic behavior of deaf children. Washington: Council for Exceptional Children, 1965. Pp. 3-11.

Cromwell, R. L. A social learning approach to mental retardation. In N. R. Ellis (Ed.), Handbook of mental deficiency. New York: McGraw-Hill, 1963. Pp. 41-91.

Edwards, A. L. Experimental design in psychological research. (Rev. ed.) New York: Holt, Rinehart, and Winston, 1963.

Ellis, N. R. Introduction. In N. R. Ellis (Ed.), Handbook of mental deficiency. New York: McGraw-Hill, 1963. Pp. 1-7.

Erwin, S. M., & Miller, W. R. Language development. In H. W. Stevenson (Ed.), Child psychology. The Sixty-Second Yearbook, National Society for the Study of Education, 1963.

Francis, W. N. The structure of American English. New York: Ronald, 1958.

Heber, R. Personality. In H. A. Stevens & R. Heber (Eds.), Mental retardation. Chicago: University of Chicago Press, 1964. Pp. 143-146.

Lindquist, E. F. Design and analysis of experiments in psychology and education. Boston: Houghton-Mifflin, 1953.

Lovell, K., & Bradbury, B. The learning of English morphology in educationally subnormal special school children. American Journal of Mental Deficiency, 1967, 71, 609-615.

Miller, W. R., & Erwin, S. M. The development of grammar in child language. Monographs for Research in Child Development, 1964, 29, 9-34.

Steele, R. G. D., & Torrie, J. H. Principles and procedures of statistics. New York: McGraw-Hill, 1960.

Strickland, R. G. Some important research gaps in the teaching of elementary school language arts. In E. R. Steinberg (Ed.), Needed research in teaching English. Washington: U. S. Government Printing Office, Cooperative Research Monograph No. 11, 1962.

Thomas, O. Transformational grammar and the teacher of English. New York: Holt, Rinehart, and Winston, 1965.

Velten, H. V. The growth of phonemic and lexical patterns in infant language. Language, 1943, 19, 281-292.

TABLE 1

Subject Variables: Means and Frequencies

| Group | CA Level | Subject Variable IQ | CA | MA | Sex | |
|---|---|---|---|---|---|---|
| Retarded | 4-5 | 74.88 | 62.25 | 47.75 | 5M | 3F |
| | 6-7 | 77.00 | 83.62 | 66.38 | 5M | 3F |
| | 8-9 | 74.62 | 107.12 | 81.50 | 5M | 3F |
| | 10-11 | 74.12 | 130.62 | 96.75 | 6M | 2F |
| Normal | 4-5 | 103.38 | 59.88 | 62.50 | 4M | 4F |
| | 6-7 | 101.62 | 83.75 | 86.00 | 4M | 4F |
| | 8-9 | 102.12 | 105.12 | 109.75 | 4M | 4F |
| | 10-11 | 100.00 | 130.25 | 133.50 | 4M | 4F |
| Superior | 4-5 | 133.75 | 59.50 | 78.62 | 3M | 5F |
| | 6-7 | 129.50 | 82.88 | 106.38 | 4M | 4F |
| | 8-9 | 126.38 | 105.12 | 135.38 | 2M | 6F |
| | 10-11 | 125.62 | 129.12 | 168.00 | 3M | 5F |

Note. -- n=8 within each of the 12 CA X IQ cells. CA and MA are expressed in months.

TABLE 2

Subject Variables: Inferential Statistics

A. Chi Square Analyses: Frequencies of Males and Females

| Comparison | df | Chi Square | Comparison | df | Chi Square |
|---|---|---|---|---|---|
| Within R | 3 | 0.415 | Within 4-5 | 2 | 1.000 |
| Within N | 3 | 0.000 | Within 6-7 | 2 | 0.335 |
| Within S | 3 | 1.067 | Within 8-9 | 2 | 2.350 |
| | | | Within 10-11 | 2 | 2.350 |
| Sum | 9 | 1.482 | Sum | 8 | 6.035 |

B. Analyses of Variance: MA, CA, IQ

| Source | df | Mean Square MA | CA | IQ |
|---|---|---|---|---|
| IQ Groups | 2 | 19,208.51*** | 25.34 | 23,032.39*** |
| CA Levels | 3 | 21,624.58*** | 21,303.96*** | 77.86 |
| G X L | 6 | 622.76*** | 3.26 | 29.91 |
| Error | 84 | 93.86 | 52.59 | 43.45 |

C. Mean Separation: Multigroup Comparisons Yielding Significant F ratios

| Variable | Comparison | $\bar{X}_i - \bar{X}_j$ | t ratio |
|---|---|---|---|
| CA (df=46) | 4-5:6-7 | 22.88 | 11.474*** |
| | 6-7:8-9 | 22.38 | 10.248*** |
| | 8-9:10-11 | 24.21 | 11.895*** |
| IQ (df=60) | R:N | 26.62 | 22.514*** |
| | N:S | 27.03 | 14.115*** |

TABLE 2 (Continued)

| Variable | Comparison | | $\bar{X}_i - \bar{X}_j$ | t ratio |
|---|---|---|---|---|
| MA (df=14) | (R:N) | 4-5 | 14.25 | 4.781*** |
| | | 6-7 | 19.62 | 3.914** |
| | | 8-9 | 28.25 | 6.647*** |
| | | 10-11 | 36.75 | 7.383*** |
| | (N:S) | 4-5 | 16.62 | 3.814** |
| | | 6-7 | 20.38 | 3.690** |
| | | 8-9 | 25.62 | 5.451*** |
| | | 10-11 | 34.50 | 5.233*** |
| | (R:S) | 4-5 | 31.50 | 6.872*** |
| | | 6-7 | 40.00 | 8.961*** |
| | | 8-9 | 53.88 | 12.515*** |
| | | 10-11 | 71.25 | 12.748*** |
| | (R) | 4-5:6-7 | 19.25 | 5.286*** |
| | | 6-7:8-9 | 15.13 | 3.968** |
| | | 8-9:10-11 | 15.25 | 4.147*** |
| | (N) | 4-5:6-7 | 24.00 | 5.318*** |
| | | 6-7:8-9 | 23.75 | 4.436*** |
| | | 8-9:10-11 | 23.75 | 4.387*** |
| | (S) | 4-5:6-7 | 27.75 | 5.275*** |
| | | 6-7:8-9 | 29.00 | 5.929** |
| | | 8-9:10-11 | 32.63 | 5.419*** |

**p of F or t <.01; ***p of F or t <.001.

TABLE 3

Mean Accuracy Scores: Retarded Group

| Element | Level of Generality/CA Level | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | English Words | | | | Rules | | | |
| | CA 4-5 | CA 6-7 | CA 8-9 | CA 10-11 | CA 4-5 | CA 6-7 | CA 8-9 | CA 10-11 |
| {-s}, nouns (car/cars) | 5.38 | 5.25 | 5.88 | 6.00 | 4.13 | 4.38 | 5.50 | 6.00 |
| {-'s}, nouns (king/king's) | 3.75 | 3.63 | 5.50 | 5.88 | 3.38 | 3.75 | 5.13 | 5.63 |
| {-s'}, nouns (king/kings') | 3.63 | 4.88 | 5.50 | 6.00 | 3.25 | 4.25 | 4.88 | 5.75 |
| {-ed}, verbs (chase/chased) | 2.13 | 3.50 | 5.00 | 4.88 | 1.25 | 2.63 | 4.13 | 4.00 |
| {-er}, adjectives (big/bigger) | 0.38 | 1.50 | 3.63 | 4.88 | 0.13 | 0.13 | 2.50 | 3.63 |
| {-er}, verbs (drive/driver) | 0.13 | 1.00 | 3.00 | 4.25 | 0.00 | 0.25 | 2.00 | 3.12 |
| {-ness}, adjectives (sleepy/sleepiness) | 0.00 | 0.00 | 0.88 | 0.50 | 0.00 | 0.00 | 0.25 | 0.13 |
| {-less}, nouns (hair/hairless) | 0.00 | 0.00 | 0.50 | 0.75 | 0.00 | 0.00 | 0.25 | 0.38 |
| {-able}, verbs (like/likeable) | 0.00 | 0.00 | 0.75 | 0.25 | 0.00 | 0.00 | 0.00 | 1.00 |

Note. -- For each element, the total possible score was 6.

TABLE 4

Mean Accuracy Scores: Normal Group

| Element | Level of Generality/CA Level | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | English Words | | | | Rules | | | |
| | CA 4-5 | CA 6-7 | CA 8-9 | CA 10-11 | CA 4-5 | CA 6-7 | CA 8-9 | CA 10-11 |
| { -s }, nouns (car/cars) | 6.00 | 5.88 | 6.00 | 6.00 | 6.00 | 5.88 | 6.00 | 6.00 |
| { -'s }, nouns (king/king's) | 4.50 | 5.75 | 6.00 | 5.88 | 4.25 | 5.88 | 6.00 | 6.00 |
| { -s' }, nouns (king/kings') | 4.75 | 6.00 | 6.00 | 6.00 | 4.50 | 5.88 | 5.75 | 6.00 |
| { -ed }, verbs (chase/chased) | 5.38 | 4.75 | 5.63 | 6.00 | 4.62 | 4.50 | 5.50 | 6.00 |
| { -er }, adjectives (big/bigger) | 1.50 | 4.38 | 5.75 | 6.00 | 0.75 | 3.13 | 5.88 | 5.88 |
| { -er }, verbs (drive/driver) | 1.00 | 1.88 | 6.00 | 5.88 | 0.38 | 0.75 | 5.00 | 5.88 |
| { -ness }, adjectives (sleepy/sleepiness) | 0.00 | 0.38 | 2.63 | 3.50 | 0.00 | 0.00 | 0.88 | 2.63 |
| { -less }, nouns (hair/hairless) | 0.00 | 0.00 | 1.38 | 3.50 | 0.00 | 0.00 | 0.50 | 2.75 |
| { -able }, verbs (like/likeable) | 0.00 | 0.13 | 0.38 | 1.13 | 0.00 | 0.13 | 0.00 | 0.25 |

Note. -- For each element, the total possible score was 6.

TABLE 5

Mean Accuracy Scores: Superior Group

| Element | Level of Generality/CA Level | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | English Words | | | | Rules | | | |
| | CA 4-5 | CA 6-7 | CA 8-9 | CA 10-11 | CA 4-5 | CA 6-7 | CA 8-9 | CA 10-11 |
| { -s }, nouns (car/cars) | 6.00 | 6.00 | 6.00 | 6.00 | 5.75 | 5.75 | 6.00 | 6.00 |
| { -'s }, nouns (king/king's) | 4.88 | 5.75 | 6.00 | 6.00 | 4.88 | 5.75 | 5.75 | 6.00 |
| { -s' }, nouns (king/kings') | 5.25 | 5.88 | 6.00 | 6.00 | 4.75 | 6.00 | 5.88 | 6.00 |
| { -ed }, verbs (chase/chased) | 5.50 | 5.88 | 5.88 | 6.00 | 5.00 | 5.38 | 6.00 | 6.00 |
| { -er }, adjectives (big/bigger) | 3.25 | 5.38 | 6.00 | 5.88 | 2.25 | 5.13 | 6.00 | 5.88 |
| { -er }, verbs (drive/driver) | 1.88 | 5.75 | 5.88 | 6.00 | 0.88 | 4.88 | 6.00 | 6.00 |
| { -ness }, adjectives (sleepy/sleepiness) | 0.00 | 1.25 | 5.50 | 5.63 | 0.00 | 0.25 | 2.75 | 4.13 |
| { -less }, nouns (hair/hairless) | 0.00 | 1.50 | 4.38 | 5.75 | 0.00 | 1.25 | 3.25 | 4.50 |
| { -able }, verbs (like/likeable) | 0.25 | 0.75 | 1.25 | 2.38 | 0.38 | 0.00 | 0.25 | 1.00 |

Note. -- For each element, the total possible score was 6.

TABLE 6

Inferential Statistics: Trends Over Age

A. Retarded Group

| Element | Level of Generality/Mean Square[a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | English Words | | | | Rules | | | |
| | MS(L) | MS(Q) | MS(C) | MS(Error) | MS(L) | MS(Q) | MS(C) | MS(Error) |
| {-s}, nouns (car/cars) | 2.50 | 0.12 | 0.62 | 1.65 | 18.22* | 0.12 | 0.90 | 2.67 |
| {-'s}, nouns (king/king's) | 27.22** | 0.50 | 4.90 | 2.72 | 26.91* | 0.03 | 1.41 | 3.93 |
| {-s'}, nouns (king/kings') | 24.02** | 1.12 | 0.10 | 3.03 | 26.41* | 0.03 | 0.16 | 4.19 |
| {-ed}, verbs (chase/chased) | 38.02** | 4.50 | 1.23 | 3.21 | 38.02** | 4.50 | 1.22 | 3.80 |
| {-er}, adjectives (big/bigger) | 97.66*** | 0.03 | 1.41 | 3.67 | 66.21*** | 2.53 | 5.26 | 3.84 |
| {-er}, verbs (drive/driver) | 82.66*** | 0.28 | 1.41 | 4.01 | 49.51*** | 1.53 | 1.81 | 3.01 |
| {-ness}, adjectives (sleepy/sleepiness) | 2.26 | 0.28 | 1.81 | 1.32 | 0.16 | 0.03 | 0.16 | 0.16 |
| {-less}, nouns (hair/hairless) | 3.02 | 0.12 | 0.22 | 0.98 | 0.76 | 0.03 | 0.06 | 0.41 |
| {-able}, verbs (like/likeable) | 0.90 | 0.50 | 1.60 | 0.54 | -- | -- | -- | -- |

TABLE 6 (Continued)

B. Normal Group

| Element | Level of Generality/Mean Square[a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | English Words | | | | Rules | | | |
| | MS(L) | MS(Q) | MS(C) | MS(Error) | MS(L) | MS(Q) | MS(C) | MS(Error) |
| { -s }, nouns (car/cars) | 0.01 | 0.03 | 0.06 | 0.03 | 0.01 | 0.03 | 0.06 | 0.03 |
| { -'s }, nouns (king/king's) | 7.66** | 3.78* | 0.16 | 0.58 | 11.56** | 5.28* | 0.76 | 1.01 |
| { -s' }, nouns (king/kings') | 5.62* | 3.12 | 0.62 | 0.77 | 7.66* | 2.53 | 1.41 | 1.23 |
| { -ed }, verbs (chase/chased) | 3.02 | 2.00 | 1.60 | 1.33 | 10.51** | 0.78 | 1.06 | 1.35 |
| { -er }, adjectives (big/bigger) | 88.51*** | 13.78** | 0.06 | 1.62 | 131.41*** | 11.28* | 3.91 | 2.65 |
| { -er }, verbs (drive/driver) | 140.62*** | 2.00 | 22.50** | 1.85 | 172.22*** | 0.50 | 21.03*** | 0.94 |
| { -ness }, adjectives (sleepy/sleepiness) | 65.02*** | 0.50 | 4.22 | 3.42 | 30.62*** | 6.12 | 0.00 | 1.67 |
| { -less }, nouns (hair/hairless) | 56.41*** | 9.03 | 0.16 | 3.07 | 30.62*** | 10.12* | 0.63 | 1.62 |
| { -able }, verbs (like/likeable) | 5.26* | 0.78 | 0.06 | 1.20 | 0.16 | 0.03 | 0.16 | 0.16 |

TABLE 6 (Continued)

C. Superior Group

| Element | Level of Generality/Mean Square[a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | English Words | | | | Rules | | | |
| | MS(L) | MS(Q) | MS(C) | MS(Error) | MS(L) | MS(Q) | MS(C) | MS(Error) |
| { -s} , nouns (car/cars) | -- | -- | -- | -- | 0.40 | -- | 0.10 | 0.18 |
| { -'s} , nouns (king/king's) | 5.26* | 1.53 | 0.06 | 1.16 | 4.56* | 0.78 | 0.51 | 0.85 |
| { -s'} , nouns (king/kings') | 2.26 | 0.78 | 0.06 | 1.16 | 5.26* | 2.53 | 1.06 | 1.23 |
| { -ed} , verbs (chase/chased) | 0.90 | 0.12 | 0.10 | 0.35 | 5.26** | 0.28 | 0.31 | 0.64 |
| { -er} , adjectives (big/bigger) | 28.90*** | 10.12* | 0.22 | 1.58 | 55.22*** | 18.00** | 0.40 | 2.04 |
| { -er} , verbs (drive/driver) | 62.50*** | 28.12*** | 5.62 | 1.62 | 108.90*** | 32.00*** | 1.22 | 0.92 |
| { -ness} , adjectives (sleepy/sleepiness) | 178.51*** | 2.53 | 20.31*** | 1.26 | 88.51*** | 2.53 | 4.56 | 1.35 |
| { -less} , nouns (hair/hairless) | 162.00*** | 0.03 | 3.31 | 3.12 | 96.10*** | 0.00 | 0.90 | 2.46 |
| { -able} , verbs (like/likeable) | 18.91* | 0.78 | 0.10 | 2.66 | 1.81 | 2.53 | 0.01 | 0.91 |

Note. -- Dashes (--) indicate that no analyses were performed because subjects responded correctly to all items or to no items in a set. See Tables 3, 4, and 5 for details.

[a] $\underline{df}$ = 1 and 28 in all comparisons. * $\underline{p}$ of $\underline{F}$ <.05; ** $\underline{p}$ of $\underline{F}$ <.01; *** $\underline{p}$ of $\underline{F}$ <.001.

TABLE 7

Inferential Statistics: Comparisons of Retarded, Normal, and Superior Groups

| Element | CA Level | t ratio[a] English Words R:N | English Words R:S | English Words N:S | Rules R:N | Rules R:S | Rules N:S |
|---|---|---|---|---|---|---|---|
| {-s}, nouns (car/cars) | 4-5 | 1.256 | 1.256 | -- | 2.526* | 2.074* | 1.000 |
| | 6-7 | 0.822 | 1.000 | 1.002 | 1.852 | 1.683 | 0.607 |
| | 8-9 | 1.002 | 1.002 | -- | 1.323 | 1.323 | -- |
| | 10-11 | -- | -- | -- | -- | -- | -- |
| {-'s}, nouns (king/king's) | 4-5 | 0.767 | 1.018 | 0.429 | 0.744 | 1.354 | 0.687 |
| | 6-7 | 2.934* | 2.839* | -- | 2.567* | 2.338* | 0.447 |
| | 8-9 | 1.323 | 1.323 | -- | 1.433 | 0.989 | 1.530 |
| | 10-11 | -- | 1.002 | 1.002 | 2.053 | 2.053 | -- |
| {-s'}, nouns (king/kings') | 4-5 | 1.011 | 1.365 | 0.514 | 0.967 | 1.152 | 0.231 |
| | 6-7 | 1.567 | 1.372 | 1.002 | 2.137* | 2.333* | 1.002 |
| | 8-9 | 1.323 | 1.323 | -- | 1.384 | 1.605 | 0.607 |
| | 10-11 | -- | -- | -- | 1.000 | 1.000 | -- |
| {-ed}, verbs (chase/chased) | 4-5 | 3.907** | 3.858** | 0.272 | 3.927** | 3.911** | 0.664 |
| | 6-7 | 1.174 | 3.010** | 1.528 | 2.169* | 4.631*** | 1.198 |
| | 8-9 | 1.107 | 1.698 | 0.859 | 1.443 | 2.143* | 1.323 |
| | 10-11 | 3.212** | 3.212** | -- | 4.735*** | 4.735*** | -- |

TABLE 7 (Continued)

| Element | CA Level | t ratio[a] English Words R:N | English Words R:S | English Words N:S | Rules R:N | Rules R:S | Rules N:S |
|---|---|---|---|---|---|---|---|
| {-er}, adjectives (big/bigger) | 4-5 | 1.992 | 3.429** | 1.862 | 1.234 | 2.443* | 1.514 |
| | 6-7 | 2.828* | 4.842*** | 1.218 | 2.904* | 9.430*** | 1.743 |
| | 8-9 | 2.415* | 2.747* | 1.530 | 3.410** | 3.565** | 1.002 |
| | 10-11 | 1.567 | 1.372 | 1.002 | 2.318* | 2.318* | -- |
| {-er}, verbs (drive/driver) | 4-5 | 1.507 | 2.027* | 0.853 | 1.000 | 1.986 | 0.864 |
| | 6-7 | 0 826 | 6.142*** | 4.808*** | 0.908 | 8.074*** | 5.796*** |
| | 8-9 | 3.310** | 3.143** | 1.002 | 3.464** | 4.856*** | 3.743** |
| | 10-11 | 2.016* | 2.198* | 1.002 | 3.112** | 3.286** | 1.002 |
| {-ness}, adjectives (sleepy/sleepiness) | 4-5 | -- | -- | -- | -- | -- | -- |
| | 6-7 | 1.427 | 1.853 | 1.208 | -- | 1.000 | 1.000 |
| | 8-9 | 1.457 | 5.552*** | 2.828* | 1.091 | 3.475** | 2.208* |
| | 10-11 | 3.241** | 13.670*** | 2.401* | 3.269** | 9.588*** | 1.759 |
| {-less}, nouns (hair/hairless) | 4-5 | -- | -- | -- | -- | -- | -- |
| | 6-7 | -- | 1.692 | 1.692 | -- | 1.722 | 1.722 |
| | 8-9 | 1.037 | 3.880** | 2.728* | 0.607 | 3.691** | 3.275** |
| | 10-11 | 2.400* | 9.664*** | 2.147* | 2.582* | 8.290*** | 1.942 |

TABLE 7 (Continued)

| Element | CA Level | t ratio[a] English Words R:N | English Words R:S | English Words N:S | Rules R:N | Rules R:S | Rules N:S |
|---|---|---|---|---|---|---|---|
| {-able}, verbs (like/ likeable) | 4-5 | -- | 1.000 | 1.000 | -- | 1.002 | 1.002 |
| | 6-7 | 1.002 | 1.821 | 1.452 | 1.002 | -- | 1.002 |
| | 8-9 | 0.607 | 0.571 | 1.071 | -- | 1.000 | 1.000 |
| | 10-11 | 1.275 | 2.753* | 1.242 | 1.000 | 2.000 | 1.342 |

Note. -- Dashes (--) indicate that no analyses were performed because subjects in one or both groups being compared responded correctly to all items or no items in a set. See Tables 3, 4, and 5 for details.

[a] $\underline{df} = 14$ in all comparisons.

*$\underline{p} < .05$; **$\underline{p} < .01$; ***$\underline{p} < .001$.

TABLE 8

Inferential Statistics:

Levels of Generality

| Element | Group | Source | Mean Square[a]/CA Level CA 4-5 | CA 6-7 | CA 8-9 | CA 10-11 |
|---|---|---|---|---|---|---|
| {-s}, nouns (car/cars) | Retarded | Forms | 6.25* | 3.06 | 0.56 | -- |
| | | Subjects | 5.43 | 8.56 | 0.99 | -- |
| | | F X S | 0.96 | 1.06 | 0.28 | -- |
| | Normal | Forms | -- | -- | -- | -- |
| | | Subjects | -- | -- | -- | -- |
| | | F X S | -- | -- | -- | -- |
| | Superior | Forms | 0.25 | 0.25 | -- | -- |
| | | Subjects | 0.25 | 0.11 | -- | -- |
| | | F X S | 0.25 | 0.11 | -- | -- |
| {-'s}, nouns (king/king's) | Retarded | Forms | 0.56 | 0.06 | 0.56 | 0.25 |
| | | Subjects | 12.49 | 8.56 | 3.85 | 0.14 |
| | | F X S | 0.28 | 0.78 | 0.28 | 0.25 |
| | Normal | Forms | 0.25 | 0.06 | -- | 0.06 |
| | | Subjects | 5.68 | 0.13 | -- | 0.06 |
| | | F X S | 0.25 | 0.21 | -- | 0.06 |
| | Superior | Forms | -- | -- | 0.25 | -- |
| | | Subjects | 6.54 | -- | 0.11 | -- |
| | | F X S | 0.29 | -- | 0.11 | -- |

TABLE 8 (Continued)

| Element | Group | Source | Mean Square[a]/CA Level CA 4-5 | CA 6-7 | CA 8-9 | CA 10-11 |
|---|---|---|---|---|---|---|
| {-s'}, nouns (king/kings') | Retarded | Forms | 0.56 | 1.56 | 1.56 | 0.25 |
| | | Subjects | 15.49 | 7.92 | 3.85 | 0.25 |
| | | F X S | 0.13 | 0.71 | 0.28 | 0.25 |
| | Normal | Forms | 0.25 | 0.06 | 0.25 | -- |
| | | Subjects | 7.25 | 0.06 | 0.11 | -- |
| | | F X S | 0.39 | 0.06 | 0.11 | -- |
| | Superior | Forms | 1.00 | 0.06 | 0.06 | -- |
| | | Subjects | 8.71 | 0.06 | 0.06 | -- |
| | | F X S | 0.57 | 0.06 | 0.06 | -- |
| {-ed}, verbs (chase/chased) | Retarded | Forms | 3.06 | 3.06 | 3.06 | 3.06* |
| | | Subjects | 9.28 | 5.92 | 7.21 | 2.06 |
| | | F X S | 1.06 | 1.21 | 0.92 | 0.35 |
| | Normal | Forms | 2.25 | 0.25 | 0.06 | -- |
| | | Subjects | 0.57 | 7.68 | 0.63 | -- |
| | | F X S | 0.54 | 0.25 | 1.06 | -- |
| | Superior | Forms | 1.00* | 1.00 | 0.06 | -- |
| | | Subjects | 3.00 | 0.39 | 0.06 | -- |
| | | F X S | 0.14 | 0.29 | 0.06 | -- |

TABLE 8 (Continued)

| Element | Group | Source | Mean Square[a]/CA Level CA 4-5 | CA 6-7 | CA 8-9 | CA 10-11 |
|---|---|---|---|---|---|---|
| {-er}, adjectives (big/bigger) | Retarded | Forms | 0.25 | 7.56 | 5.06 | 6.25 |
| | | Subjects | 0.29 | 1.99 | 12.78 | 9.71 |
| | | F X S | 0.39 | 2.13 | 0.92 | 1.82 |
| | Normal | Forms | 2.25 | 6.25 | 0.06 | 0.06 |
| | | Subjects | 2.82 | 11.29 | 0.13 | 0.06 |
| | | F X S | 1.11 | 1.39 | 0.21 | 0.06 |
| | Superior | Forms | 4.00 | 0.25 | -- | -- |
| | | Subjects | 8.43 | 3.00 | -- | -- |
| | | F X S | 2.57 | 0.25 | -- | -- |
| {-er}, verbs (drive/driver) | Retarded | Forms | 0.06 | 2.25 | 4.00* | 5.06 |
| | | Subjects | 0.06 | 3.82 | 11.43 | 9.85 |
| | | F X S | 0.06 | 0.96 | 0.57 | 1.35 |
| | Normal | Forms | 1.56 | 5.06 | 4.00** | -- |
| | | Subjects | 3.13 | 4.85 | 0.29 | 0.25 |
| | | F X S | 0.56 | 1.78 | 0.29 | -- |
| | Superior | Forms | 4.00 | 3.06* | 0.06 | -- |
| | | Subjects | 6.25 | 2.13 | 0.06 | -- |
| | | F X S | 1.14 | 0.49 | 0.06 | -- |

TABLE 8 (Continued)

| Element | Group | Source | Mean Square[a]/CA Level CA 4-5 | CA 6-7 | CA 8-9 | CA 10-11 |
|---|---|---|---|---|---|---|
| {-ness}, adjectives (sleepy/sleepiness) | Retarded | Forms | -- | -- | 1.56 | 0.56 |
| | | Subjects | -- | -- | 3.20 | 0.71 |
| | | F X S | -- | -- | 0.99 | 0.28 |
| | Normal | Forms | -- | 0.56 | 12.25* | 3.06* |
| | | Subjects | -- | 0.28 | 7.43 | 10.21 |
| | | F X S | -- | 0.28 | 1.82 | 0.35 |
| | Superior | Forms | -- | 4.00 | 30.25*** | 9.00*** |
| | | Subjects | -- | 3.14 | 3.68 | 1.11 |
| | | F X S | -- | 1.00 | 1.11 | 0.43 |
| {-less}, nouns (hair/hairless) | Retarded | Forms | -- | -- | 0.25 | 0.56 |
| | | Subjects | -- | -- | 2.25 | 2.92 |
| | | F X S | -- | -- | 0.25 | 0.13 |
| | Normal | Forms | -- | -- | 3.06 | 2.25 |
| | | Subjects | -- | -- | 3.78 | 13.54 |
| | | F X S | -- | -- | 0.78 | 0.68 |
| | Superior | Forms | -- | 0.25 | 5.06* | 6.25** |
| | | Subjects | -- | 10.39 | 10.28 | 0.68 |
| | | F X S | -- | 0.11 | 0.49 | 0.39 |

TABLE 8 (Continued)

| Element | Group | Source | Mean Square[a]/CA Level CA 4-5 | CA 6-7 | CA 8-9 | CA 10-11 |
|---|---|---|---|---|---|---|
| {-able}, verbs (like/likeable) | Retarded | Forms | -- | -- | 2.25 | 0.25 |
| | | Subjects | -- | -- | 0.96 | 0.11 |
| | | F X S | -- | -- | 0.96 | 0.11 |
| | Normal | Forms | -- | -- | 0.56 | 3.06 |
| | | Subjects | -- | 0.25 | 0.56 | 3.13 |
| | | F X S | -- | -- | 0.56 | 0.92 |
| | Superior | Forms | 0.06 | 2.25 | 4.00 | 7.56 |
| | | Subjects | 1.56 | 0.68 | 3.14 | 5.56 |
| | | F X S | 0.06 | 0.68 | 1.57 | 0.99 |

[a]For all comparisons, dfs were the following: F, 1; S, 7; F X S, 7.

*p of F <.05; **p of F <.01; ***p of F <.001.

TABLE 9

Inferential Statistics: Variations Among Morphemes

A. Analyses of Variance

| Group | CA Level | Mean Square[a] English Words Form | Subjects | F X S | Rules Form | Subjects | F X S |
|---|---|---|---|---|---|---|---|
| Retarded | 4-5 | 34.50*** | 7.24 | 0.61 | 24.21*** | 9.32 | 2.06 |
| | 6-7 | 36.63*** | 9.80 | 1.99 | 31.97*** | 6.22 | 1.46 |
| | 8-9 | 39.52*** | 9.74 | 1.95 | 40.29*** | 11.05 | 2.04 |
| | 10-11 | 49.22*** | 4.41 | 1.11 | 48.72*** | 3.74 | 1.66 |
| Normal | 4-5 | 51.54*** | 1.98 | 1.03 | 49.71*** | 2.86 | 1.16 |
| | 6-7 | 54.70*** | 3.32 | 1.36 | 58.28*** | 2.49 | 1.50 |
| | 8-9 | 42.06*** | 2.72 | 1.25 | 55.82*** | 1.14 | 0.49 |
| | 10-11 | 24.91*** | 4.90 | 1.68 | 37.34*** | 2.86 | 1.01 |
| Superior | 4-5 | 50.72*** | 6.60 | 1.89 | 47.02*** | 5.32 | 1.66 |
| | 6-7 | 42.92*** | 2.08 | 1.45 | 51.38*** | 2.16 | 1.01 |
| | 8-9 | 19.84*** | 1.38 | 1.29 | 34.93*** | 2.14 | 0.89 |
| | 10-11 | 11.23*** | 0.57 | 0.57 | 22.75*** | 0.73 | 0.44 |

TABLE 9 (Continued)

B. Critical Differences[b] Used in Mean Separation:

Multiple Variable Comparisons Yielding Significant F ratios

| Group | Age Level | English Words | | Rules | |
|---|---|---|---|---|---|
| | | d (05) | d (01) | d (05) | d (01) |
| Retarded | CA 4-5 | 1.272 | 1.687 | 1.493 | 1.981 |
| | CA 6-7 | 1.469 | 1.948 | 1.255 | 1.665 |
| | CA 8-9 | 1.451 | 1.925 | 1.486 | 1.972 |
| | CA 10-11 | 1.097 | 1.455 | 1.336 | 1.772 |
| Normal | CA 4-5 | 1.054 | 1.398 | 1.118 | 1.484 |
| | CA 6-7 | 1.213 | 1.609 | 1.277 | 1.694 |
| | CA 8-9 | 1.162 | 1.542 | 0.726 | 0.963 |
| | CA 10-11 | 1.350 | 1.791 | 1.046 | 1.388 |
| Superior | CA 4-5 | 1.430 | 1.897 | 1.340 | 1.778 |
| | CA 6-7 | 1.252 | 1.661 | 1.045 | 1.386 |
| | CA 8-9 | 1.175 | 1.559 | 0.983 | 1.304 |
| | CA 10-11 | 0.788 | 1.045 | 0.690 | 0.915 |

[a]For the analyses of variance, dfs were the following: F, 8; S, 7; F X S, 56.

[b]For the t ratios used to obtain the critical differences, df = 56.

***p of F <.001.

## Figure Captions

FIGURE 1. Morphology Task: Sequence of Items Within the Sixteen Sets of Task Items

FIGURE 2. Subjects' Performance on the Morphology Task

FIGURE 3. Similarities and Differences among Morphemes

A. Retarded Group

B. Normal Group

C. Superior Group

FIGURE 1

Morphology Task: Sequence of Items Within the Sixteen Sets of Task Items

PROCEDURES: Task

| Set | Part A | | Part B | | Part C | |
|---|---|---|---|---|---|---|
| 1. {-s}: English words | A1 | A17 | B1 | B17 | C1 | C17 |
| 2. {-er} (noun marker): rule | A2 | A18 | B2 | B18 | C2 | C18 |
| 3. {-ed}: English words | A3 | A19 | B3 | B19 | C3 | C19 |
| 4. {-less}: rule | A4 | A20 | B4 | B20 | C4 | C20 |
| 5. {-'s, -s'}: English words | A5 | A21 | B5 | B21 | C5 | C21 |
| 6. {-ness}: rule | A6 | A22 | B6 | B22 | C6 | C22 |
| 7. {-er} (adjective): English words | A7 | A23 | B7 | B23 | C7 | C23 |
| 8. {-able}: rule | A8 | A24 | B8 | B24 | C8 | C24 |
| 9. {-s}: rule | A9 | A25 | B9 | B25 | C9 | C25 |
| 10. {-er} (noun marker): English words | A10 | A26 | B10 | B26 | C10 | C26 |
| 11. {-ed}: rule | A11 | A27 | B11 | B27 | C11 | C27 |
| 12. {-less}: English words | A12 | A28 | B12 | B28 | C12 | C28 |
| 13. {-'s, -s'}: rule | A13 | A29 | B13 | B29 | C13 | C29 |
| 14. {-ness}: English words | A14 | A30 | B14 | B30 | C14 | C30 |
| 15. {-er} (adjective): rule | A15 | A31 | B15 | B31 | C15 | C31 |
| 16. {-able}: English words | A16 | A32 | B16 | B32 | C16 | C32 |

To the Editor:

Dear Sir:

I understand that this paper might be published on a page having a 4.5 x 7.0 inch printed area. The diagrams have been drawn with this in mind. May I make the following suggestions:

1. Since there are nine diagrams, they might best be arranged three on a page, as indicated.
2. If this is done I suggest that the group of words at the top be removed from the diagrams and set in bold-face type at the right margin. See my sketch. This will permit larger reproduction of the graphs themselves, and lessen confusion.
3. Because lines and points are often coincident, I believe it would be least confusing to place a legend at the bottom as illustrated, rather than labelling individual lines.

Richard C. Rhindress, Illustrator
University of Georgia Research Shops

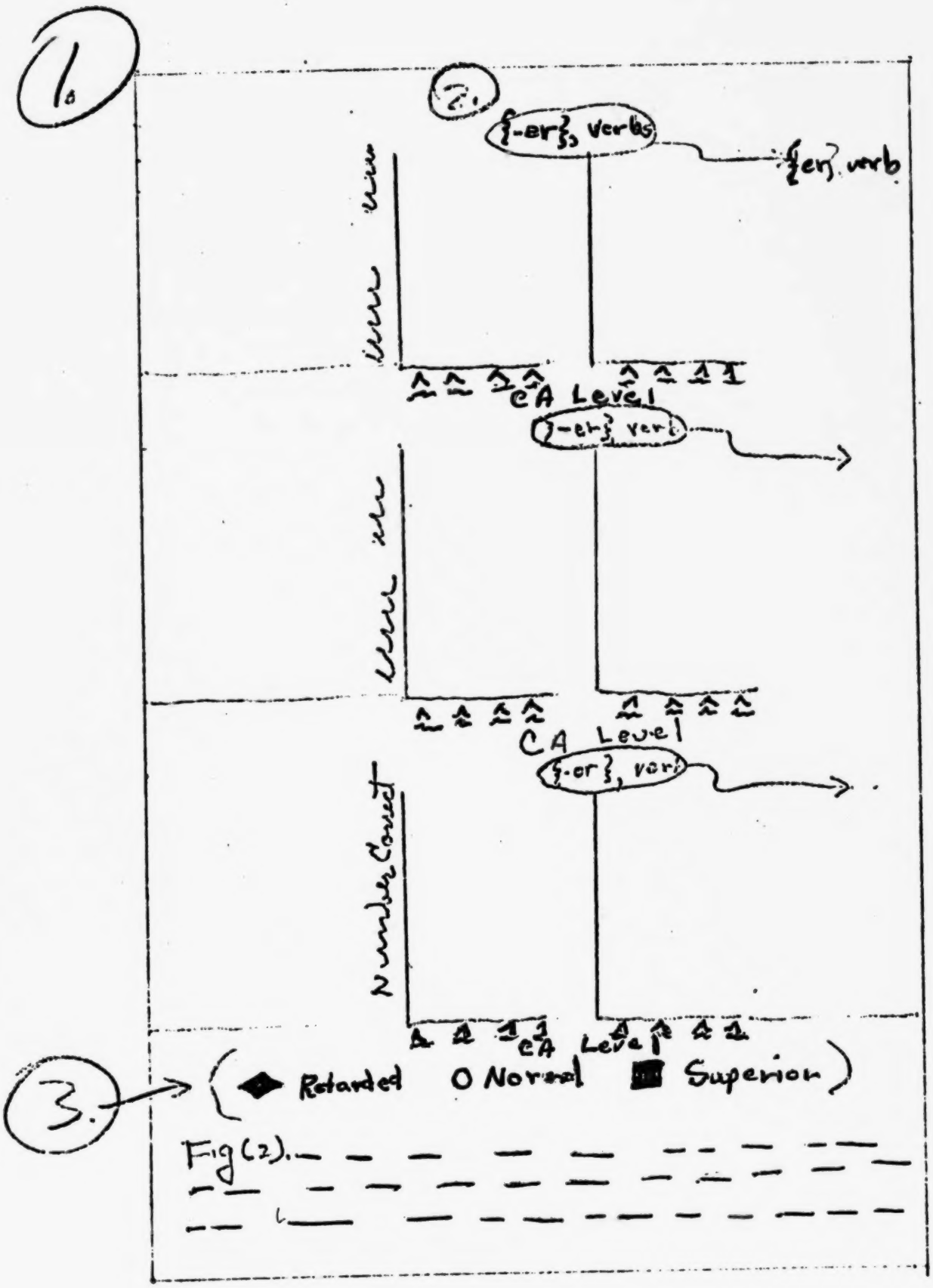



Fig (2).

Not to scale.

FIGURE 2

Subjects' Performance on the Morphology Task

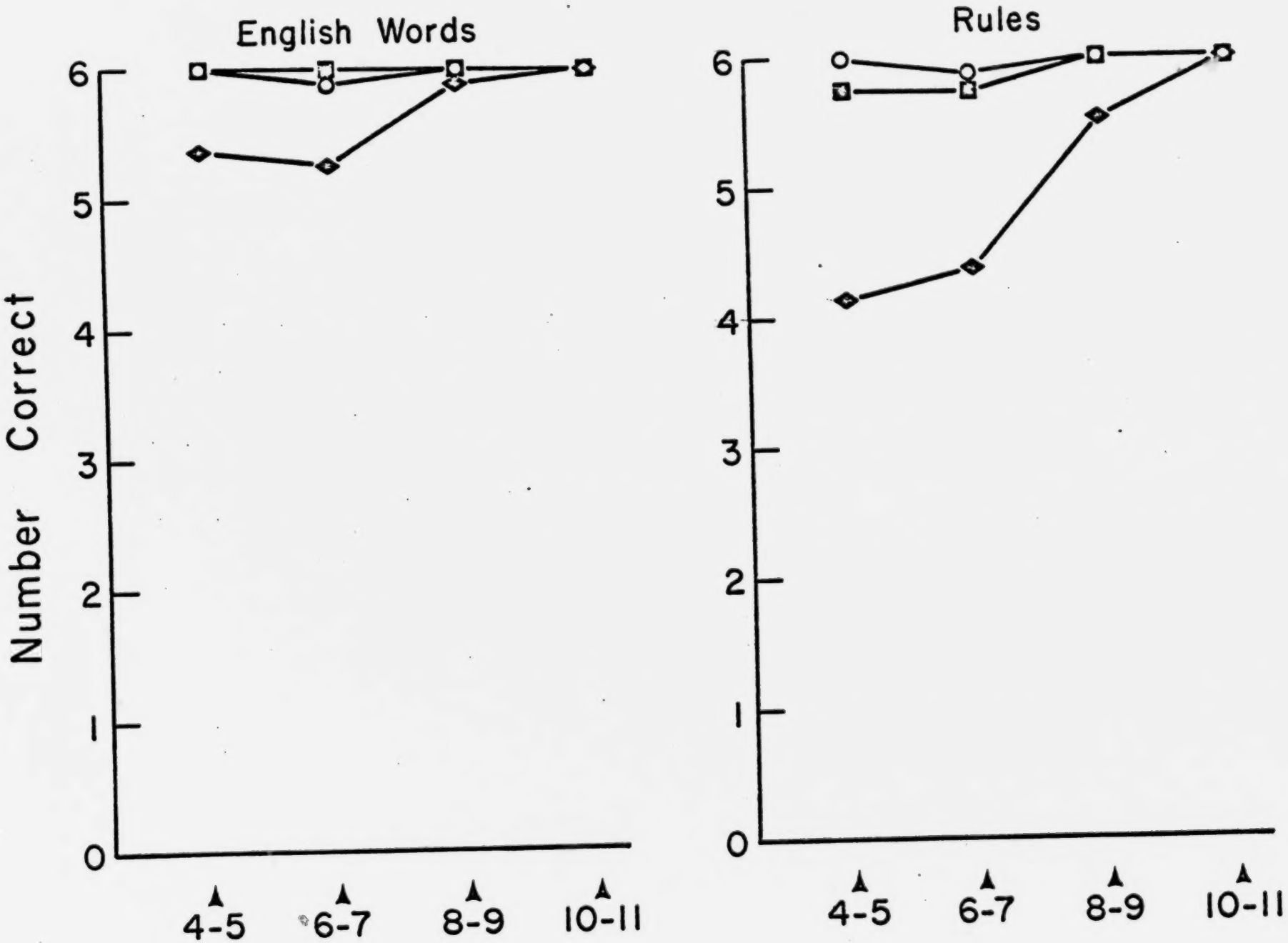
Note

Legend: Retarded

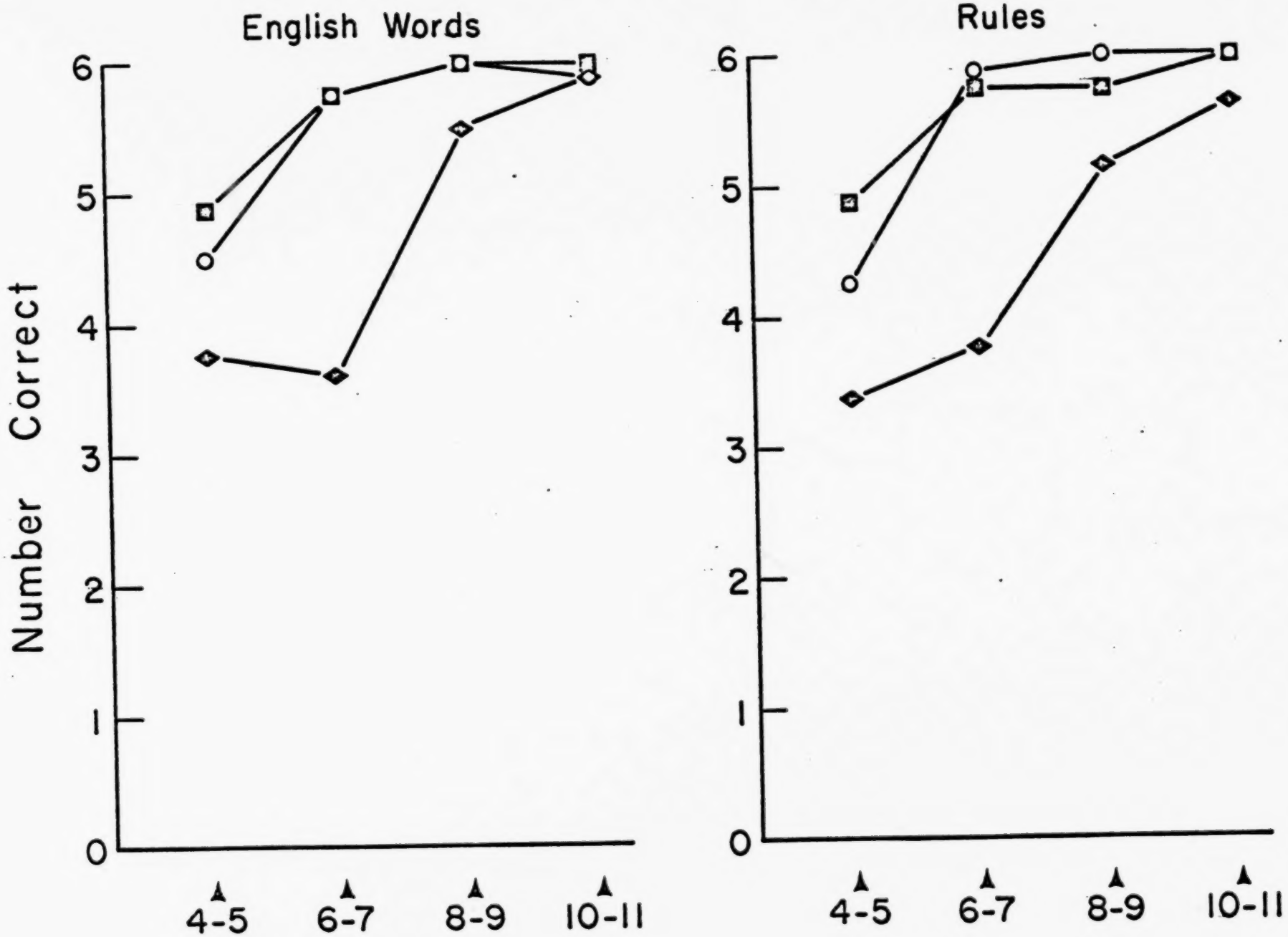
Normal

Superior

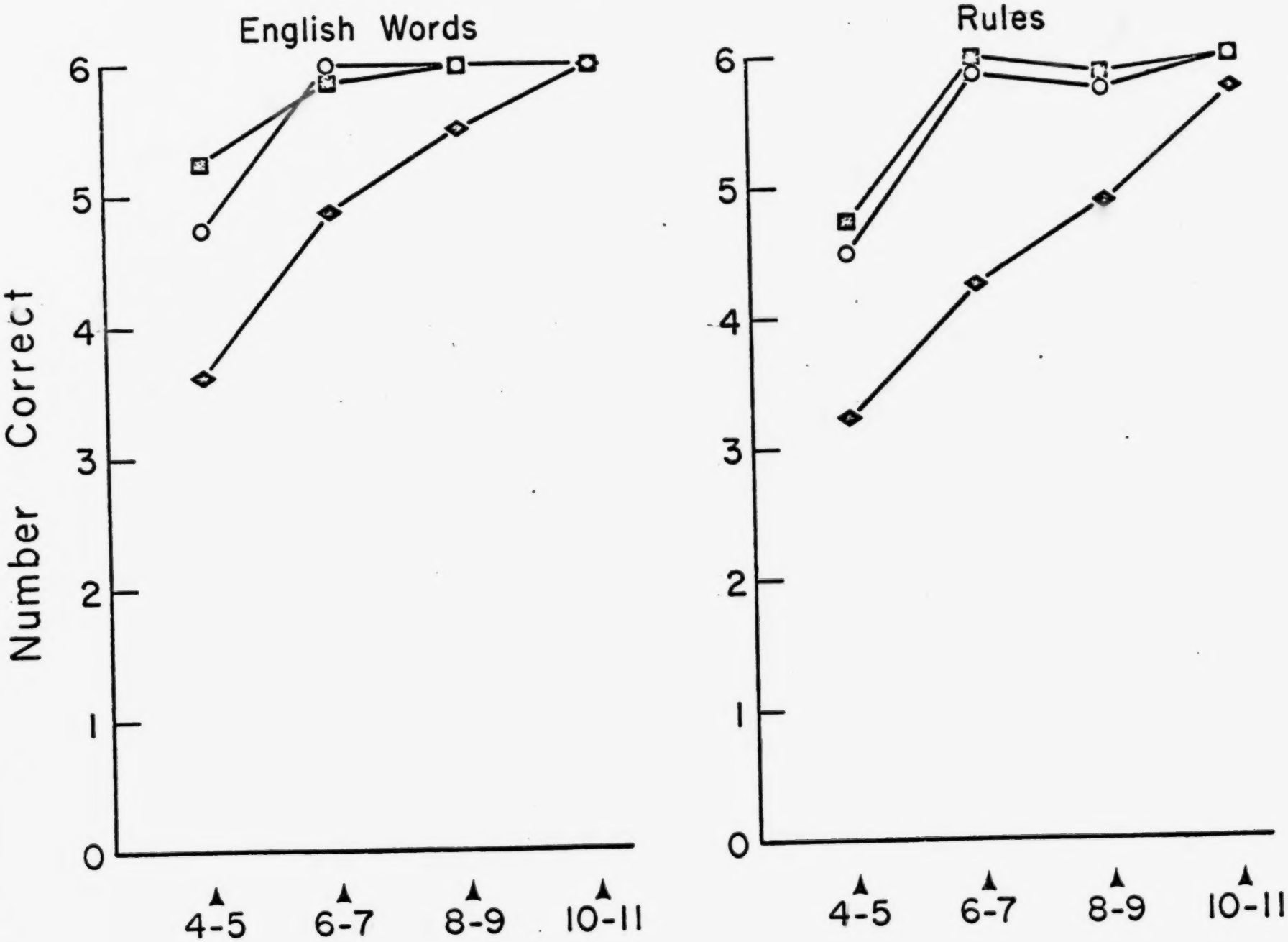
{-s}, nouns


English Words
Rules
Number Correct
6
5
4
3
2
1
0
4-5
6-7
8-9
10-11
CA Level

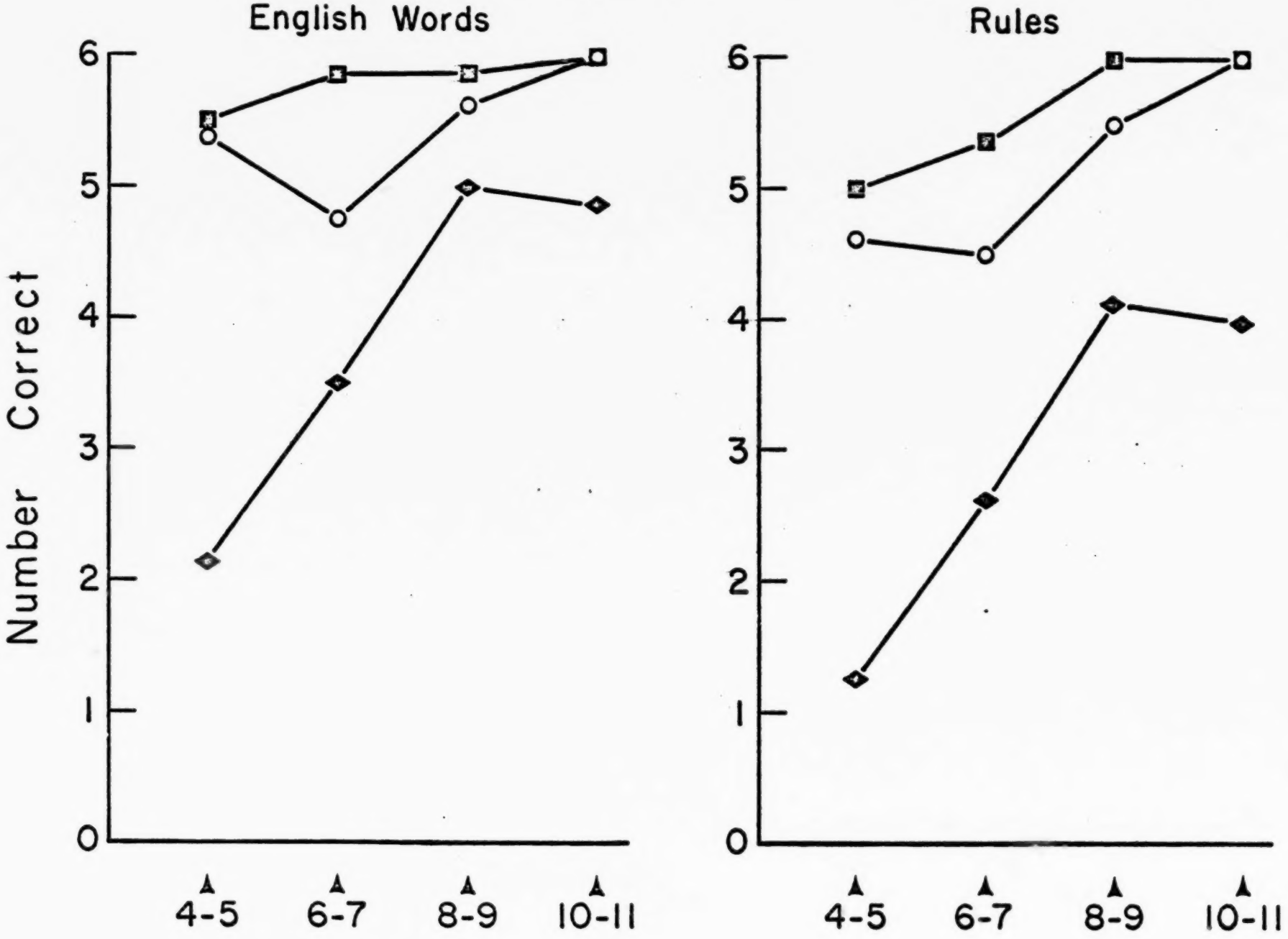
{-'s}, nouns


English Words
Rules
Number Correct
6
5
4
3
2
1
0
4-5
6-7
8-9
10-11
CA Level

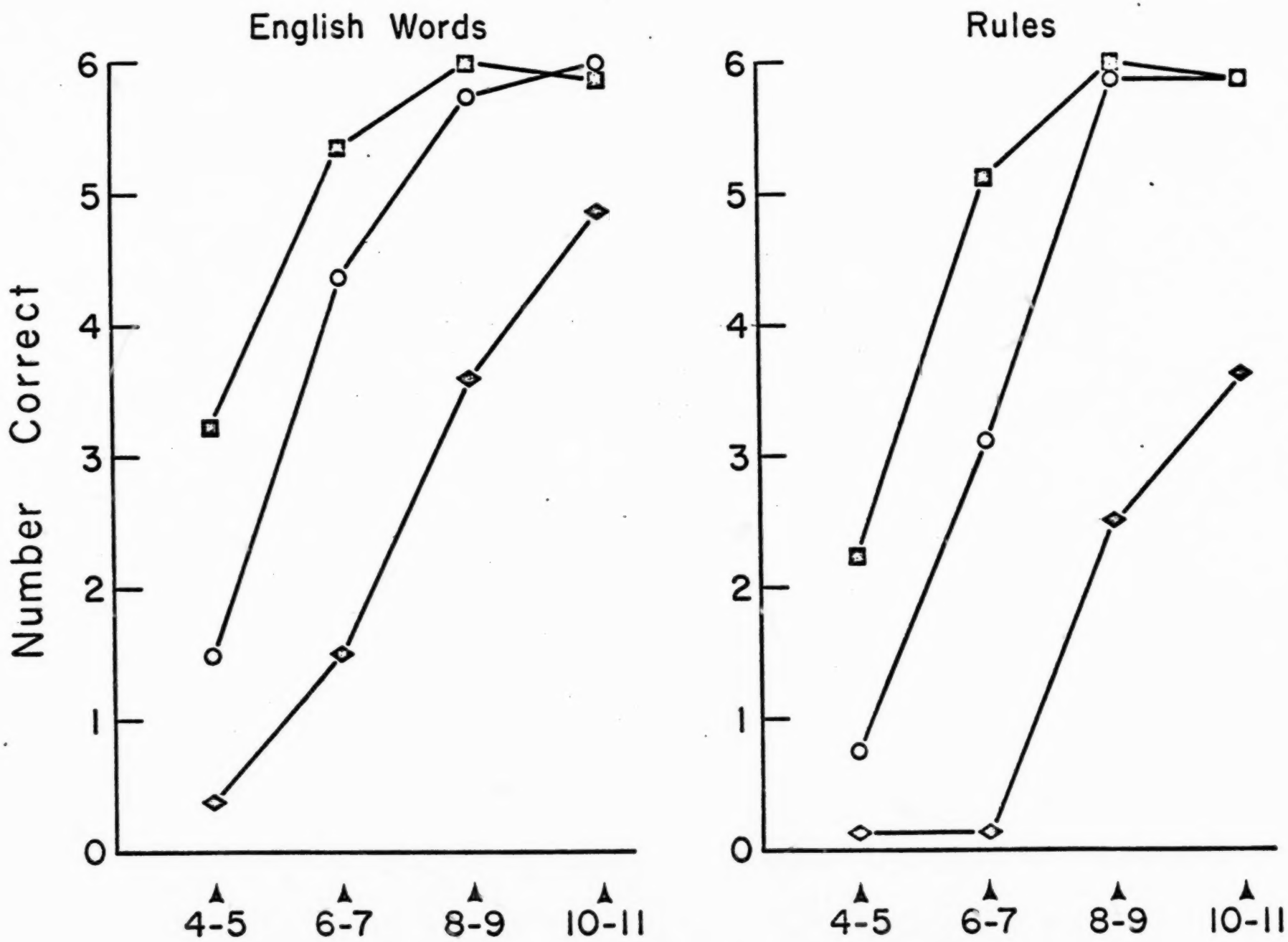
{-s'}, nouns


English Words
Rules
Number Correct
0
1
2
3
4
5
6
4-5
6-7
8-9
10-11
CA Level

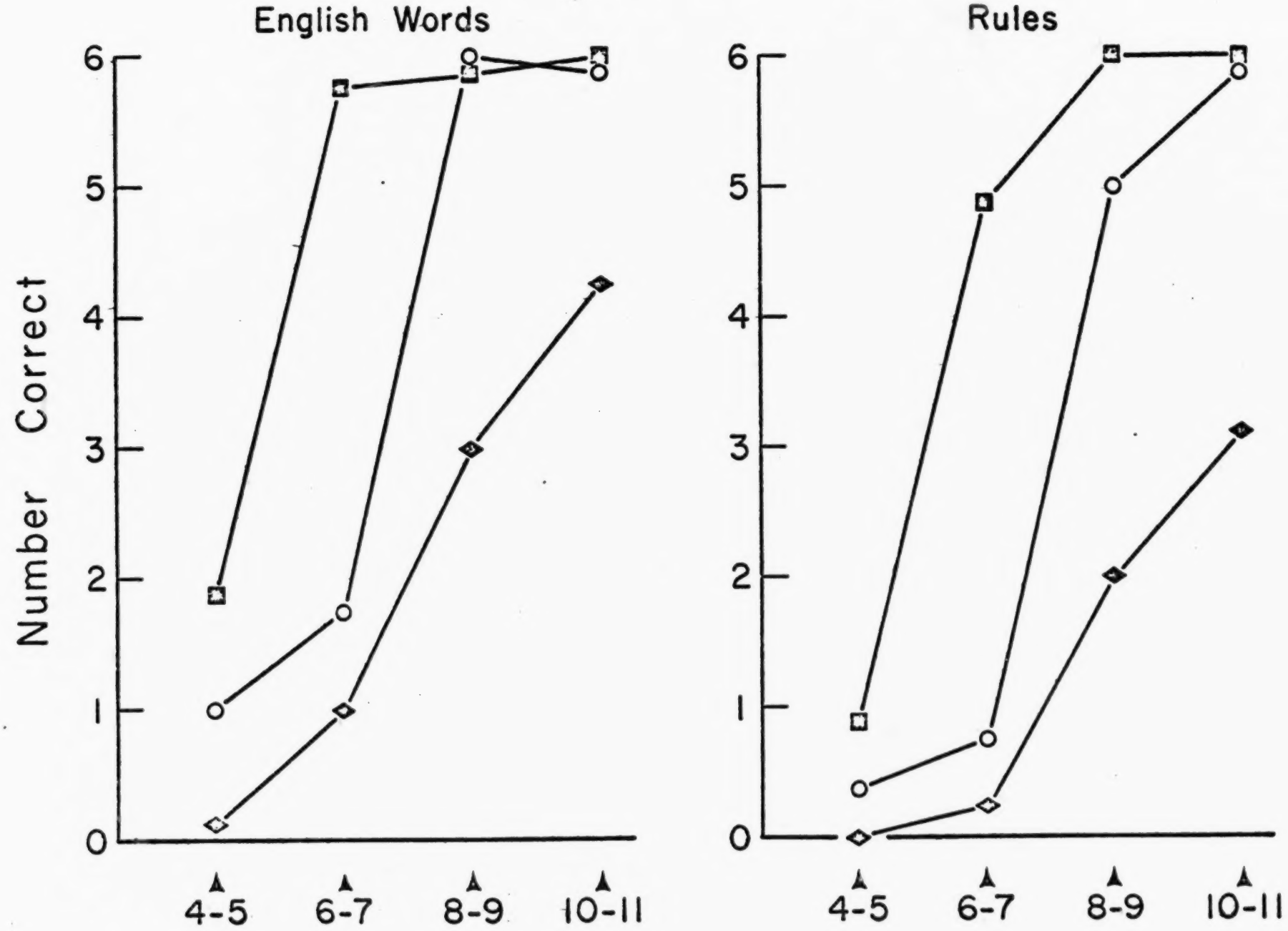
[-ed], Verbs


English Words
Rules
Number Correct
0
1
2
3
4
5
6
4-5
6-7
8-9
10-11
CA Level

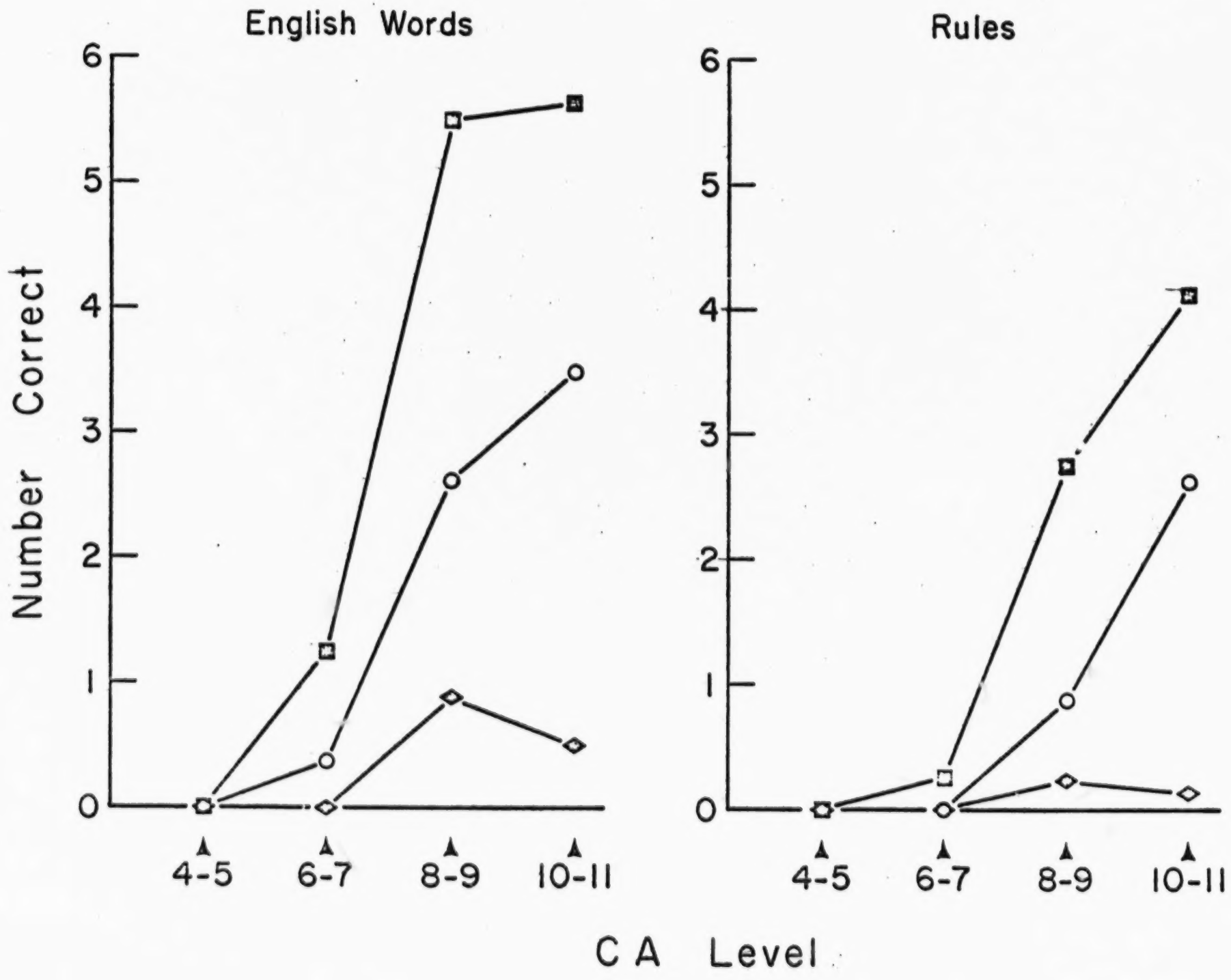
{-er}, adjectives



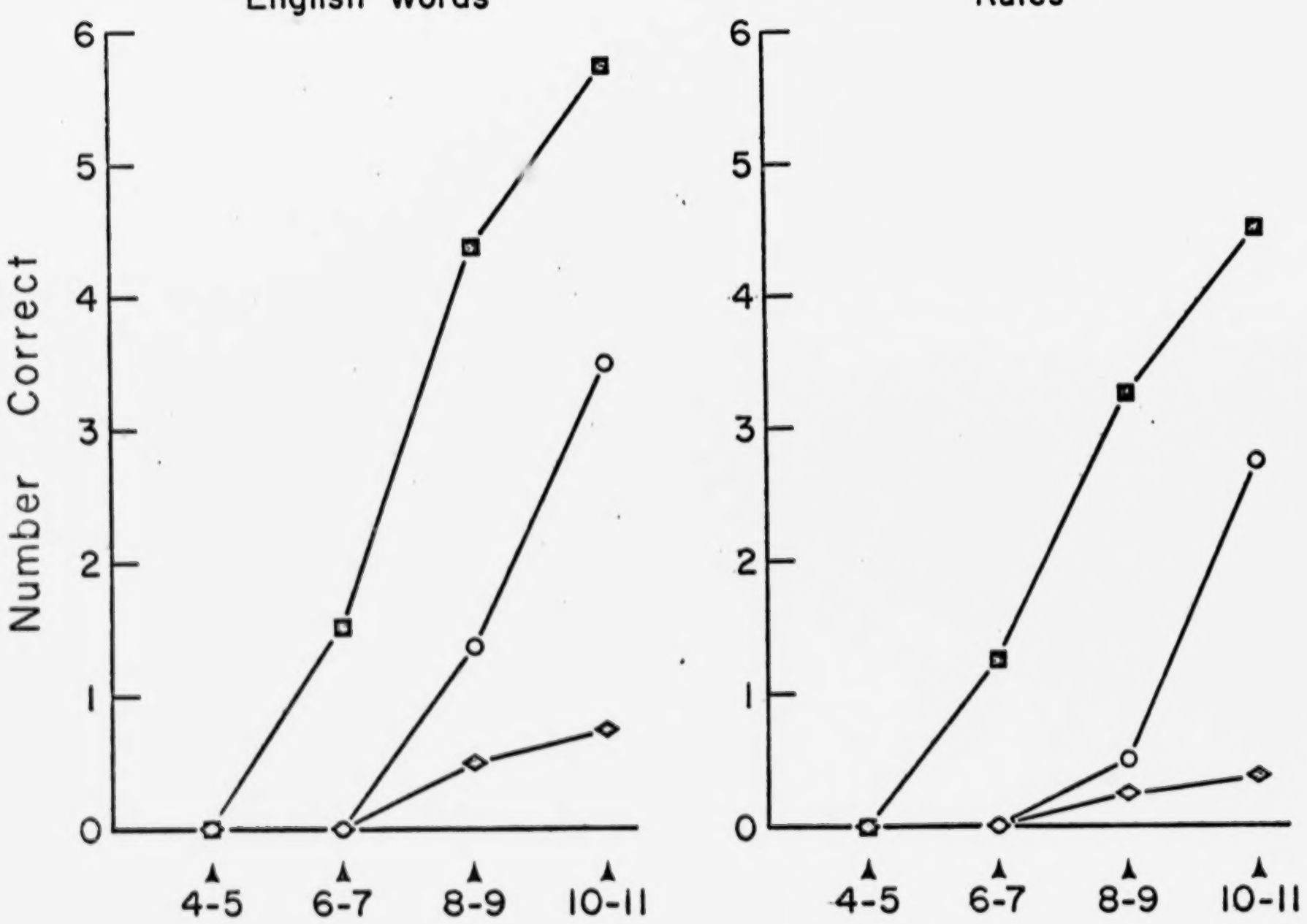
{-er}, verbs


English Words
Rules
Number Correct
0
1
2
3
4
5
6
4-5
6-7
8-9
10-11
CA Level

{-ness}, adjectives



{-less}, nouns


English Words
Rules
Number Correct
0
1
2
3
4
5
6
4-5
6-7
8-9
10-11
CA Level

{-able}, verbs

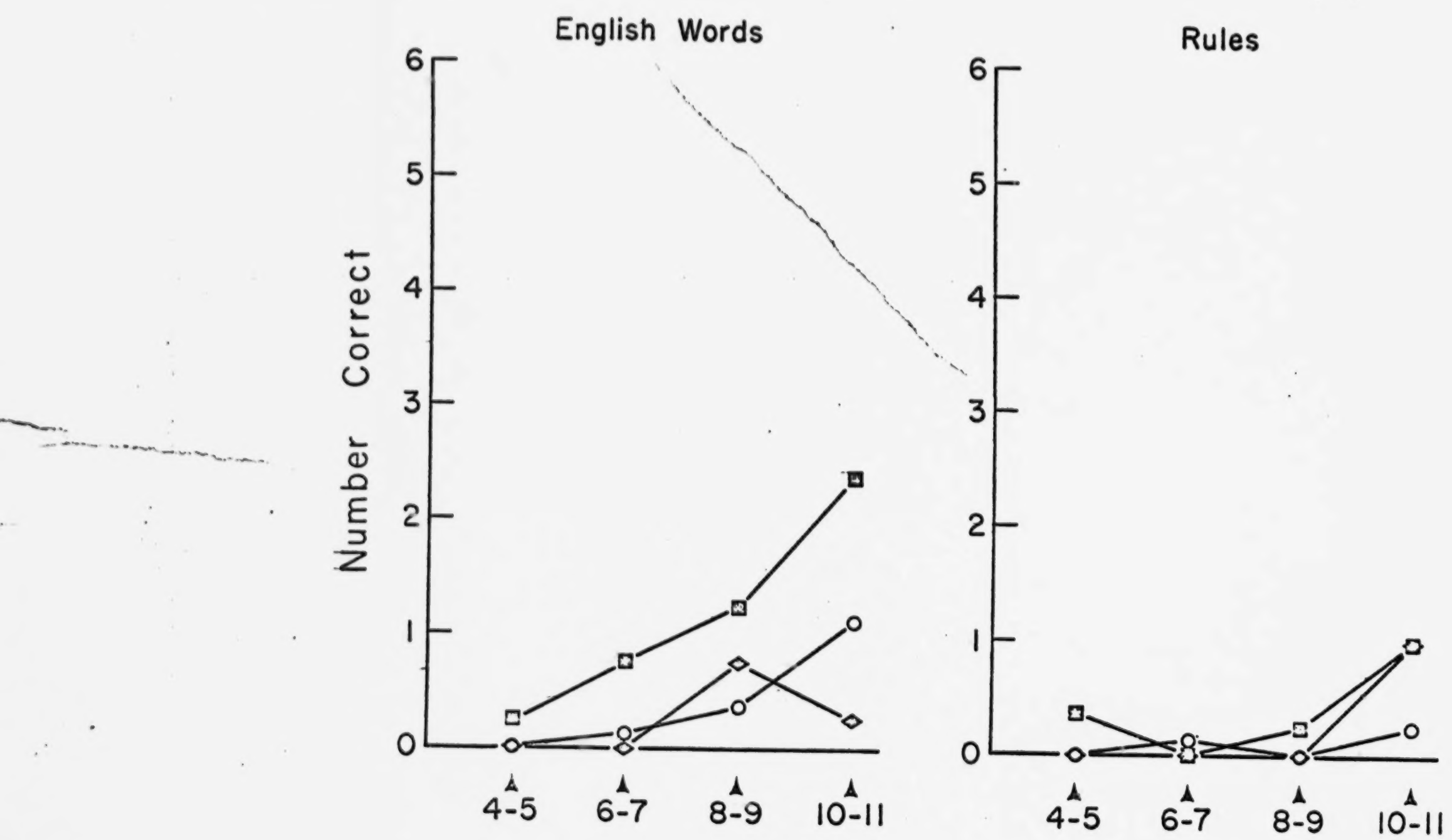

English Words
Rules
Number Correct
6
5
4
3
2
1
0
4-5
6-7
8-9
10-11
CA Level

FIGURE 3

Similarities and Differences among Morphemes

A. Retarded Group

B. Normal Group

C. Superior Group

A. Retarded Group

| CA Levels | English Words: Set | | Range of Accuracy (%) | Rules: Set | | Range of Accuracy (%) |
|---|---|---|---|---|---|---|
| 4-5 | 1. | [-s] | 90 | 1. | [-s, -'s, -s'] | 69 - 54 |
| | 2. | [-'s, -s'] | 62 - 60 | 2. | [-ed, -er(adj), -er(v) -ness, -less, -able] | 21 - 0 |
| | 3. | [-ed] | 34 | | | |
| | 4. | [-er(adj), -er(v), -ness, -less, -able] | 6 - 0 | | | |
| 6-7 | 1. | [-s, -s'] | 88 - 81 | 1. | [-s, -s', -'s] | 73 - 71 |
| | 2. | [-s', -'s, -ed] | 81 - 58 | 2. | [-'s, -ed] | 71 - 44 |
| | 3. | [-er(adj), -er(v)] | 25 - 17 | 3. | [-er(adj), -er(v), -ness, -less, -able] | 2 - 0 |
| | 4. | [-er(v), -ness, -less -able] | 17 - 0 | | | |
| 8-9 | 1. | [-s, -'s, -s', -ed] | 98 - 83 | 1. | [-s, -'s, -s', -ed] | 92 - 69 |
| | 2. | [-ed, -er(adj)] | 83 - 60 | 2. | [-er(adj), -er(v)] | 42 - 33 |
| | 3. | [-er(adj), -er(v)] | 60 - 50 | 3. | [-ness, -less, -able] | 4 - 0 |
| | 4. | [-ness, -able, -less] | 15 - 8 | | | |
| 10-11 | 1. | [-s, -'s, -s', -ed, -er(adj)] | 100 - 81 | 1. | [-s, -'s, -s'] | 100 - 96 |
| | 2. | [-ed, -er(adj), -er(v)] | 81 - 71 | 2. | [-ed, -er(adj), -er(v)] | 67 - 52 |
| | 3. | [-ness, -less, -able] | 8 - 4 | 3. | [-ness, -less, -able] | 2 - 17 |

Note. -- Elements within sets do not differ. Except for overlapping between adjacent sets, elements in a given set exceed those in subsequent sets; overlapping is indicated by listing a suffix in two sets.

B. Normal Group

| CA Levels | English Words: Set | English Words: Range of Accuracy (%) | Rules: Set | Rules: Range of Accuracy (%) |
|---|---|---|---|---|
| 4-5 | 1. [-s, -ed] | 100 - 90 | 1. [-s] | 100 |
| | 2. [-ed, -s', -'s] | 90 - 75 | 2. [-ed, -'s, -s'] | 77 - 75 |
| | 3. [-er(adj), -er(v)] | 25 - 17 | 3. [-er(adj), -er(v), -ness, -less, -able] | 13 - 0 |
| | 4. [-ness, -less, -able] | 0 - 0 | | |
| 6-7 | 1. [-s, -'s, -s'] | 98 - 100 | 1. [-s, -'s, -s'] | 98 - 98 |
| | 2. [-s, -'s, -ed] | 98 - 79 | 2. [-ed] | 75 |
| | 3. [-ed, -er(adj)] | 79 - 73 | 3. [-er(adj)] | 52 |
| | 4. [-er(v)] | 31 | 4. [-er(v), -able, -ness, -less] | 13 - 0 |
| | 5. -ness, -able, -less | 6 - 0 | | |
| 8-9 | 1. [-s, -'s, -s', -ed, -er(adj), -er(v)] | 100 - 100 | 1. [-s, -'s, -er(adj), -s', -ed] | 100 - 92 |
| | 2. [-ness] | 44 | 2. [-ed, -er(v)] | 92 - 83 |
| | 3. [-less, -able] | 23 - 6 | 3. [-ness, -less] | 15 - 8 |
| | | | 4. [-less, -able] | 8 - 0 |
| 10-11 | 1. [-s, -'s, -s', -ed, -er(adj), -er(v)] | 100 - 98 | 1. [-s, -'s, -s', -ed, -er(adj), -er(v)] | 100 - 98 |
| | 2. [-ness, -less] | 58 - 58 | 2. [-less, -ness] | 46 - 44 |
| | 3. [-able] | 19 | 3. [-able] | 4 |

Note. -- Elements within sets do not differ. Except for overlapping between adjacent sets, elements in a given set exceed those in subsequent sets; overlapping is indicated by listing a suffix in two sets.

C. Superior Group

| CA Levels | English Words: Set | English Words: Range of Accuracy (%) | Rules: Set | Rules: Range of Accuracy (%) |
|---|---|---|---|---|
| 4-5 | 1. [-s, -ed, -s', -'s] | 100 - 81 | 1. [-s, -ed, -'s, -s'] | 96 - 79 |
| | 2. [-er(adj), -er(v)] | 54 - 31 | 2. [-er(adj)] | 38 |
| | 3. [-able, -ness, -less] | 4 - 0 | 3. [-er(v), -able, -ness, -less] | 15 - 0 |
| 6-7 | 1. [-s, -s', -ed, -'s -er(v), -er(adj)] | 100 - 90 | 1. [-s', -s, -'s, -ed, -er(adj)] | 100 - 86 |
| | 2. [-less, -ness, -able] | 25 - 13 | 2. [-s, -'s, -ed, -er(adj), -er(v)] | 86 - 81 |
| | | | 3. [-less, -ness] | 21 - 4 |
| | | | 4. [-ness, -able] | 4 - 0 |
| 8-9 | 1. [-s, -'s, -s', -er(adj), -ed, -er(v), -ness] | 100 - 92 | 1. [-s, -ed, -er(adj), -er(v), -s', -'s] | 100 - 96 |
| | 2. [-ness, -less] | 92 - 73 | 2. [-less, -ness] | 54 - 46 |
| | 3. [-able] | 21 | 3. [-able] | 4 |
| 10-11 | 1. [-s, -'s, -s', -er(adj), -ed, -er(v), -less, -ness] | 100 - 94 | 1. [-s, -'s, -s', -ed, -er(v), -er(adj)] | 100 - 98 |
| | 2. [-able] | 40 | 2. [-less, -ness] | 75 - 69 |
| | | | 3. [-able] | 17 |

Note. -- Elements within sets do not differ. Except for overlapping between adjacent sets, elements in a given set exceed those in subsequent sets; overlapping is indicated by listing a suffix in two sets.

# APPENDIX

## VERBAL COMMENTS USED TO ESTABLISH THE LINGUISTIC ENVIRONMENTS FOR THE SIXTEEN SETS OF TASK ITEMS[a]

---

[a]The alphanumeric designation preceding each item indicates the part of the test in which it appeared and its position in the sequence of task items administered to the subjects.

## Plural {-s} With Nouns

English Words

A1. This is a car.

Now there is another one.

There are two _____.

A17. This is a boy.

Now there is another one.

There are two _____.

B1. This is a dog.

Now there is another one.

There are two _____.

B17. This is a hand.

Now there is another one.

There are two _____.

C1. This is a wagon.

Now there is another one.

There are two _____.

C17. This is a tree.

Now there is another one.

There are two _____.

Rules

A9. This is a wug.

Now there is another one.

There are two _____.

A25. This is a woy.

Now there is another one.

There are two _____.

B9. This is a jid.

Now there is another one.

There are two _____.

B25. This is a tor.

Now there is another one.

There are two _____.

C9. This is a lun.

Now there is another one.

There are two _____.

C25. This is a yee.

Now there is another one.

There are two _____.

## Singular {-'s} and Plural {-s'} Possessive With Nouns

| | English Words | Rules |
|---|---|---|
| A5. | This is a king who owns a crown.<br>Whose crown is it?<br>It is the _____ crown.<br>Now there are two kings.<br>They both own crowns.<br>Whose crowns are they?<br>They are the _____ crowns. | A13. This is a smig who owns a basket.<br>Whose basket is it?<br>It is the _____ basket.<br>Now there are two smigs<br>They both own baskets.<br>Whose baskets are they?<br>They are the _____ baskets. |
| A21. | This is a bird who owns a worm.<br>Whose worm is it?<br>It is the _____ worm.<br>Now there are two birds.<br>They both own worms.<br>Whose worms are they?<br>They are the _____ worms. | A29. This is a quol who owns a sign.<br>Whose sign is it?<br>It is the _____ sign.<br>Now there are two quols.<br>They both own signs.<br>Whose signs are they?<br>They are the _____ signs. |
| B5. | This is a girl who owns a bear.<br>Whose bear is it?<br>It is the _____ bear.<br>Now there are two girls.<br>They both own bears.<br>Whose bears are they.<br>They are the _____ bears. | B13. This is a lun who owns a flag.<br>Whose flag is it?<br>It is the _____ flag.<br>Now there are two luns.<br>They both own flags.<br>Whose flags are they?<br>They are the _____ flags. |

Singular {-'s} and Plural {-s'} Possessive With Nouns (Continued)

| | English Words | Rules |
|---|---|---|
| B21. | This is a kitten who owns a bat.<br>Whose bat is it?<br>It is the _____ bat.<br>Now there are two kittens.<br>They both own bats.<br>Whose bats are they?<br>They are the _____ bats. | B29. This is a pung who owns a book.<br>Whose book is it?<br>It is the _____ book.<br>Now there are two pungs.<br>They both own books.<br>Whose books are they?<br>They are the _____ books. |
| C5. | This is a monkey who owns a banana.<br>Whose banana is it?<br>It is the _____ banana.<br>Now there are two monkeys.<br>They both own bananas.<br>Whose bananas are they?<br>They are the _____ bananas. | C13. This is a bimpey who owns a flower.<br>Whose flower is it?<br>It is the _____ flower.<br>Now there are two bimpeys.<br>They both own flowers.<br>Whose flowers are they?<br>They are the _____ flowers. |
| C21. | This is a dog who owns a bone.<br>Whose bone is it?<br>It is the _____ bone.<br>Now there are two dogs.<br>They both own bones.<br>Whose bones are they?<br>They are the _____ bones. | C29. This is a jid who owns a tie.<br>Whose tie is it?<br>It is the _____ tie.<br>Now there are two jids.<br>They both own ties.<br>Whose ties are they?<br>They are the _____ ties. |

## Past Tense {-ed} With Verbs

### English Words

A3. Here is a dog who knows how to chase.
He is chasing.
He did the same thing yesterday.
Yesterday he _____.

A19. Here is a girl who knows how to jump.
She is jumping.
She did the same thing yesterday.
Yesterday she _____.

B3. Here is a dog who knows how to bark.
He is barking.
He did the same thing yesterday.
Yesterday he _____.

B19. Here are some children who know how to march.
They are marching.
They did the same thing yesterday.
Yesterday they _____.

### Rules

A11. Here is a man who knows how to zos.
He is zossing.
He did the same thing yesterday.
Yesterday he _____.

A27. Here is a boy who knows how to fip.
He is fipping.
He did the same thing yesterday.
Yesterday he _____.

B11. Here is a man who knows how to gitch.
He is gitching.
He did the same thing yesterday.
Yesterday he _____.

B27. Here is a man who knows how to hif.
He is hiffing.
He did the same thing yesterday.
Yesterday he _____.

## Past Tense {-ed} With Verbs (Continued)

English Words

C3. Here is a boy who knows how to laugh.
He is laughing.
He did the same thing yesterday.
Yesterday he _____.

C19. Here is a boy who knows how to fix.
He is fixing.
He did the same thing yesterday.
Yesterday he _____.

Rules

C11. Here is a girl who knows how to bix.
She is bixing.
She did the same thing yesterday.
Yesterday she _____.

C27. Here is a boy who knows how to dack.
He is dacking.
He did the same thing yesterday.
Yesterday he _____.

## Comparative {-er} With Adjectives

English Words

A7. See the boy and the man.
The boy is big.
The man is even _____.

A23. Here are some sad girls.
This girl is sad.
This girl is even _____.

Rules

A15. This horse has cugs on him.
This horse has more cugs on him.
This horse is cuggy.
This horse is even _____.

Comparative {-er} With Adjectives (Continued)

| English Words | Rules |
|---|---|
| B7. These children are running.<br>They are fast.<br>The girl is fast.<br>The boy is even _____. | A31. This dog has nids on him.<br>This dog has more nids on him.<br>This dog is niddy.<br>This dog is even _____. |
| B23. Here are some fat men.<br>This man is fat.<br>This man is even _____. | B15. This dog has jats on him.<br>This dog has more jats on him.<br>This dog is jatty.<br>This dog is even _____. |
| C7. It is a sunny day.<br>These girls are warm.<br>This girl is warm.<br>This girl is even _____. | B31. These children are playing in the rost.<br>This girl has rost on her.<br>This girl has more rost on her.<br>This girl is rosty.<br>This girl is even _____. |
| C23. Here are some sleepy boys.<br>This boy is sleepy.<br>This boy is even _____. | C15. This dog has quirps on him.<br>This dog has more quirps on him.<br>This dog is quirpy.<br>This dog is even _____.<br>C31. This hat has joms on it.<br>This hat has more joms on it.<br>This hat is jommy.<br>This hat is even _____. |

## Noun Marker {-er} With Verbs

### English Words

A10. This is a man who knows how to drive.

He is driving.

What would you call someone who drives? _____

A26. This is a boy who knows how to run.

He is running.

What would you call someone who runs? _____

B10. This is a woman who knows how to sing.

She is singing.

What would you call someone who sings? _____

B26. This is a boy who knows how to play.

He is playing.

What would you call someone who plays? _____

C10. This is a boy who knows how to paint.

He is painting.

What would you call someone who paints? _____

C26. This is a girl who knows how to help.

She is helping.

What would you call someone who helps? _____

Noun Marker {-er} With Verbs (Continued)

Rules

A2. This is a man who knows how to jev.

He is jevving.

What would you call someone who jevs? _____

A18. This is a boy who knows how to smay.

He is smaying.

What would you call someone who smays? _____

B2. This is a girl who knows how to yin.

She is yinning.

What would you call someone who yins? _____

B18. This is a girl who knows how to mot.

She is motting.

What would you call someone who mots? _____

C2. This is a girl who knows how to bip.

She is bipping.

What would you call someone who bips? _____

C18. This is a boy who knows how to gling.

He is glinging.

What would you call someone who glings? _____

## Noun Marker {-ness} With Adjectives

| English Words | Rules |
|---|---|
| A14. This girl is very sleepy.<br>Her _____ is easy to see. | A6. This telephone is very knoppy.<br>It's _____ is easy to see. |
| A30. This seal is very black.<br>His _____ is easy to see. | A22. These toys are very oit.<br>Their _____ is easy to see. |
| B14. This turtle is very slow.<br>His _____ is easy to see. | B6. This camel is very wassy.<br>His _____ is easy to see. |
| B30. These cookies are very good.<br>Their _____ is easy to see. | B22. This boy is very holk.<br>His _____ is easy to see. |
| C14. This girl is very happy.<br>Her _____ is easy to see. | C6. This sheep is very yow.<br>His _____ is easy to see. |
| C30. This pig is very fat.<br>It's _____ is easy to see. | C22. This kitten is very lud.<br>Her _____ is easy to see. |

## Adjective Marker {-less} With Nouns

| English Words | Rules |
|---|---|
| A12. This turtle does not have any hair.<br>Really, he is _____. | A4. This boy does not have any muer.<br>Really, he is _____. |
| A28. This apple does not have any color.<br>Really, it is _____. | A20. This mouse does not have any seber.<br>Really, she is _____. |

Adjective Marker {-less} With Nouns (Continued)

| English Words | Rules |
|---|---|
| B12. This man does not have a hat. Really, he is _____. | B4. This little girl does not have any hibar. Really, she is _____. |
| B28. This doll does not have a mother. Really, she is _____. | B20. This rooster does not have any heum. Really, he is _____. |
| C12. This lion does not have a name. Really, he is _____. | C4. These shoes do not have any biom. Really, they are _____. |
| C28. This puppy does not have a home. Really, he is _____. | C20. This turkey does not have any ket. Really, he is _____. |

Adjective Marker {-able} With Verbs

| English Words | Rules |
|---|---|
| A16. This clown is easy to like. Really, he is very _____. | A8. This rabbit is easy to rik. Really, he is very _____. |
| A32. This book is easy to read. Really, it is very _____. | A24. This lion is easy to mish. Really, he is very _____. |
| B16. This saw is easy to use. Really, it is very _____. | B8. This elephant is easy to bowk. Really, he is very _____. |

Adjective Marker {-able} With Verbs (Continued)

| English Words | Rules |
| --- | --- |
| B32. This problem is easy to work. Really, it is very _____. | B24. This horse is easy to kaed. Really, he is very _____. |
| C16. This shirt is easy to wash. Really, it is very _____. | C8. This drum is easy to lich. Really, it is very _____. |
| C32. Spot is easy to teach. Really, he is very _____. | C24. This little girl is easy to ros. Really, she is very _____. |